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Electrical World

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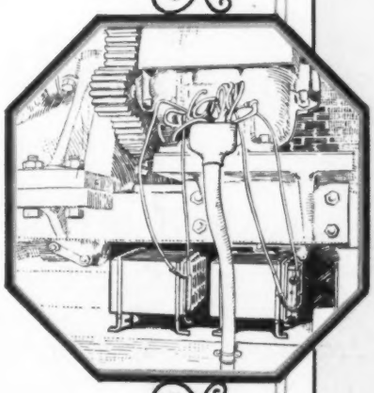

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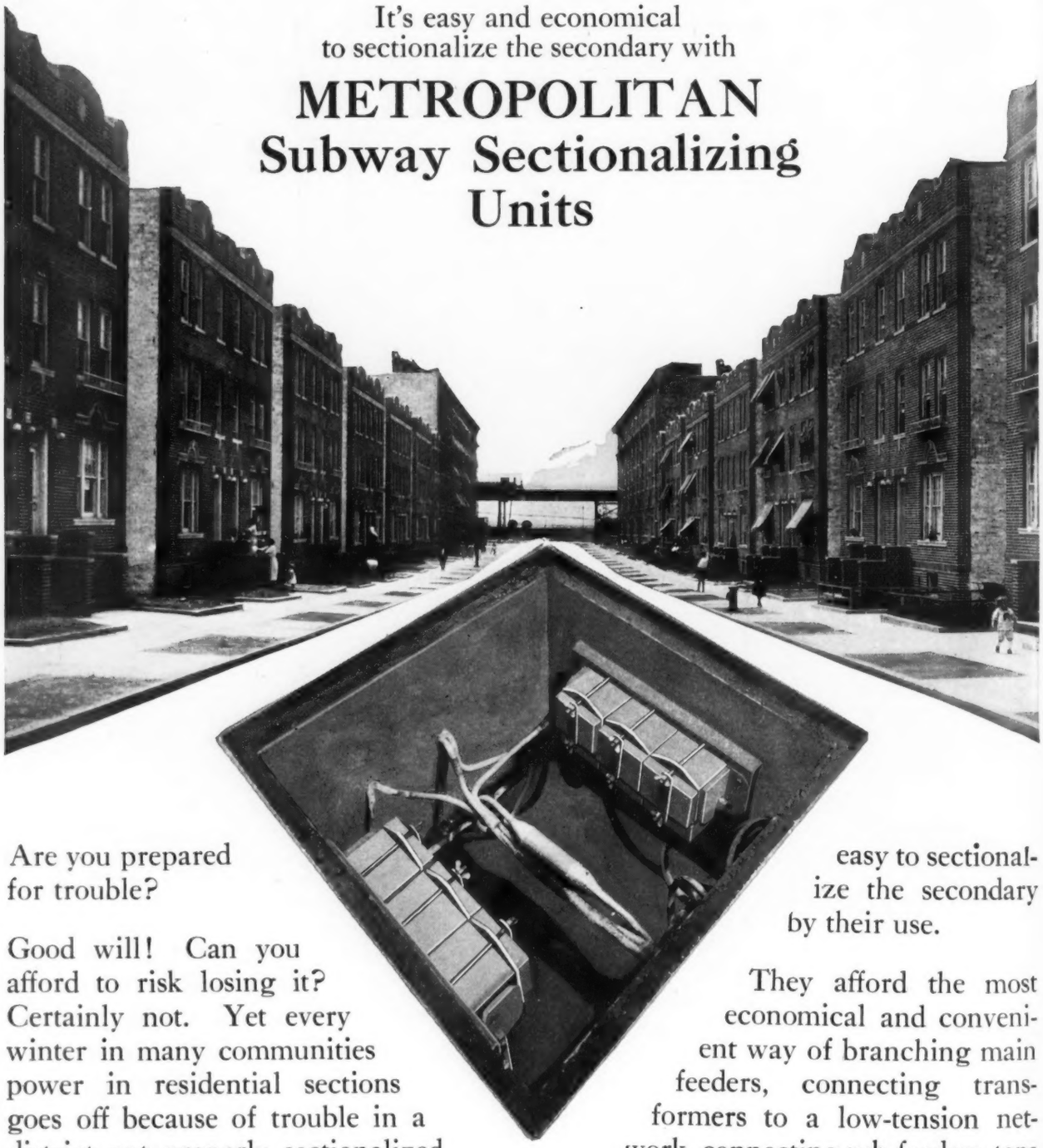

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They afford the most economical and convenient way of branching main feeders, connecting transformers to a low-tension network, connecting sub-feeders, taps and tie lines and connecting services, safely cutting out any bad section.

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Electrical World

The consolidation of Electrical World, Electrical Engineer and American Electrician

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W. H. ONKEN, JR. Editor

HAROLD V. BOZELL Editor

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The Pacific Coast Rejects Public Ownership

FOR the second time the voters of California have said "no" decisively on the water and power act. In the State of Washington the same verdict was given on the Bone bill. Both were political measures of broad scope which proposed to take over the property of private utilities and allow political subdivisions to engage in the business of developing and distributing electrical energy on a large scale.

The provisions of the water and power act are well known. Although the campaign for the amendment this year was tied in with the "La Follette for President" drive, the measure was defeated by a plurality of nearly 400,000, an even greater margin than two years ago, when it was beaten by 354,000 votes. The less familiar Bone bill, proposed for the first time this year, was said to have had its origin in a desire on the part of Seattle and Tacoma, already deeply involved in municipal ownership, to unload their burden on the taxpayers of the state. Fortunately for those who have to bear the tax burden, the measure was defeated by a plurality of about seventy-five thousand votes. The campaigns waged against these measures by the power companies were largely of an educational nature, and every central-station employee fought loyally for his business and the best interests of the public.

With this expression of confidence on the part of the public in the efficacy of private management and operation of electric utilities, the power companies may be expected to continue with their large development programs and with their policy of providing an adequate and dependable supply of electrical energy at the lowest possible rates.

Honor to a British Pioneer of Electrical Engineering

OF THE many engineers from foreign shores who have visited this country in recent months, none is more highly regarded or welcome in the electrical engineering profession than Dr. S. Z. de Ferranti of England. A pioneer in electrical engineering on the British Isles, Dr. Ferranti was far in advance of his day even a quarter of a century ago. The Institution of Electrical Engineers elected him president in 1910, and our own American Institute of Electrical Engineers placed his name on its list of honorary members. While still a very young man he engineered what was then a mammoth steam station on the Thames outside of London from which electricity was transmitted by underground cable at 10,000 volts to the city.

Dr. Ferranti's interest in electrical work is as keen today as ever. To his broad vision and inventive ability may be attributed the bleeding of the intermediate stages of steam turbines and the reheating of the steam, both of which are part of advanced practice in steam-turbine stations today. However, it is to his remarks at a luncheon given in his honor last week that we desire to call attention—particularly to his dream of the day when all household service shall come by wire. In electrical matters Americans think of their English cousins as backward, and perhaps rightly so; but Dr. Ferranti is an exception. His place is in the foremost rank, and none are more ready to applaud and emulate him than his cis-Atlantic confrères.

Now Let Business Go on with Neither Timidity Nor Recklessness

BUSINESS in America is proverbially timid. Every four years it hesitates, falters and postpones until the presidential election shall be over. It fears sweeping changes in governmental policies. It even listens to alarmists who prophesy the overthrow of the Constitution amid a reign of confiscation and chaos. It does not really believe these doleful vaticinations, but it wants to be sure. This year there was perhaps more ground for the ultra-cautious attitude than is usually the case. The candidates of the two old parties were admittedly both men of character, ability and conservatism. There was nothing alarming in their party platforms interpreted in the light shed by the nominees. But the third party arose, with its radical proposals. It declared for public ownership and operation of utilities and for a constitutional amendment to limit the power of the Supreme Court to sustain the fundamental law of the nation against Congress. Business was told that there was real danger that the election of a President would be thrown into the House, that in such an event a Bryan would become the Chief Magistrate—and after that the deluge.

On Wednesday of last week the needlessness of these alarms was manifest to the world. The essential conservatism of the American people was once more vindicated. The third party carried one state in forty-eight. On the Pacific Coast, where in the past public ownership has had its greatest popularity—and where the electric light and power industry at least had real reason to await the verdict before forming new plans—California and Washington alike refused to have anything to do with the initiated measures designed to promote state and municipal generation and distribution of electricity. As for the "red" menace seen by a few over-excitable writers and speakers, that dwindled everywhere to utter insignificance, and it was once more made clear that it is European absolutism and not American democracy that breeds social and political revolution.

The result of the election is naturally hailed with enthusiasm by industry all over the country. Timidity has been cast aside, and there is danger that it may be succeeded by recklessness. Against any tendency of this kind, however, all wise and right-thinking

business leaders will stand like a rock. Especially may the electric light and power industry in all its branches be trusted to keep its head, to maintain its high standards and, more even than before, to seek profit only through service, to win success only through desert. It can be so conducted that public ownership, in the electrical field at any rate, will before another presidential election comes around have ceased to be agitated.

The American in Foreign Trade

FOREIGN business men frequently comment on the ineptitude of the average American manufacturer in foreign trade. It seems to be impossible, they say, for most Americans to develop the right psychology in dealing with foreign buyers. In this connection the following true story is illuminating:

An English manufacturer, on a recent visit to this country, approached a Chicago manufacturer for the purpose of buying some small permanent magnets to be used by him in the assembly of his principal manufactured product. He inquired on what basis the Chicago manufacturer could furnish the magnets in the comparatively large quantities required.

After spending some time figuring, the American said: "I can let you have these in the quantity you want at 43 cents each f.o.b. Chicago." Said the Englishman: "I am sorry, but they will do me no good in Chicago. If I had them in Manchester, I might use them. Furthermore, I haven't any cents to pay you with. I would have to buy in shillings, and they are apparently no good. Goodby." And he started toward the door.

"Wait a minute," said the American. "Come back and let me see."

Again he figured for some minutes and then said to the Englishman: "I'll cut my price three-fourths of a cent."

Fish Industry Versus Power Production

THROUGH what must have been a lack of understanding of the true situation, California at the recent election passed an initiated measure withdrawing nearly all of the Klamath River in northern California from power development for all time. A fish and game district has been created including 175 miles of the stream from the mouth of the Shasta River to the ocean for the purpose of protecting the annual run of salmon. This includes the most valuable section of the river for power development and renders useless half a million horsepower.

Why it was thought necessary to take such a step when the Federal Power Commission had positively stated that no licenses for power development would be permitted until a means should have been found for preserving existing fish conditions is hard to understand. A much more sensible procedure is the plan being followed in the Pacific Northwest, where harmony exists between fishing and power interests. Here the Fish and Game Commissions of Washington and Oregon and of the federal government and the department of fisheries of the University of Washington are cooperating with the power companies in experiments to find a means of passing fish over high dams. Results obtained so far with a fish elevator at one of the power dams in Washington would seem to indicate that at least one solution of the problem has been found.

The voters of California by their action have removed from the reach even of the state itself northern California's greatest remaining power stream. The irony of the action is that northern California, which is most vitally concerned, voted to defeat the bill, whereas southern California, more than eight hundred miles removed from the stream in question, voted overwhelmingly in favor of it. The fishermen's victory is thus not due to those presumably most familiar with the principles and conditions involved. We trust that other states which are wrestling with the same problem will not be misguided by California's action and remove from use a great natural resource—hydro-electric power.

Stability of Employment in the Light and Power Industry

AS WAS to be expected, the election of President Coolidge has given business real acceleration and encouragement, and the country will see much sound business expansion as a result thereof. But on the wave of sound business expansion will also be found many new business enterprises launched in craft which may prove unseaworthy when heavier seas are encountered. These new ventures will attract many young men with visions of future wealth to be attained all too easily, and many of these men may suffer the fate of a certain young man who resigned his assured five-thousand-dollar position to accept "a salary of $20,000 and a share in the profits" of a new enterprise—which failed completely in four months.

In the electric light and power industry, however, young men may find opportunities in a non-speculative business. In spite of what some regard as a mushroom growth, the electric light and power industry has established itself so firmly that in bad times as well as good the banking fraternity regards electric light and power securities as stable ones. And, as is most pertinent to the subject under discussion, a recent survey by a leading university showed that in times of slump its graduates in the electric light and power industry fared better than those in any other line of activity.

It is one thing to make enough money to be assured of an honest living in good times and bad; it is still another to do constructive work which benefits the public and the state. To couple the two is the opportunity offered in the electric light and power industry, whose records show an accomplishment worthy any man's ideals and a stability which ought to be reassuring to any right-thinking young man.

Isolated Phases and Truck-Type Boards "Make Good"

A CONSERVATIVE policy is advisable in power-station design under modern conditions because costs are high and reliability of service is paramount. It speaks well for phase isolation and truck-type switchboards, therefore, to find that they are becoming accepted design practices in many new stations.

Experience with phase isolation up to date has been very satisfactory because it eliminates the chance of disastrous phase-to-phase short circuits and introduces elements of safety and reliability without excessive costs. The vertical type of isolation is most favored,

and experience has shown that careful design will limit phase-to-ground troubles in marked degree. The fundamental principle of design is to secure actual isolation and separation of every potential trouble-giving apparatus on each phase. The bus, the oil breakers, the disconnecting switches and the instrument transformers should be separate compartments if possible.

The truck-type switchboard has had a hard fight, but several installations have been made successfully and the cost handicap has been found more fancied than real. The great saving in floor space and building space reduces costs very materially, and in addition the labor cost introduced by built-up bus and switch compartments is eliminated. The avoidance of other things, such as troubles in alignment, in level and in repair, together with operating inconvenience and dangerous hazards, also contributes to popularize the truck-type board.

The adoption and popularity of these two innovations in power stations are illustrative of the continued improvements brought about by the hard work of forward-looking engineers.

The Industry Needs Facts Instead of Guesswork

TO A MORE than usual degree with the passing of this presidential election the business horizon has brightened and preparations are immediately afoot for larger activities. Particularly is this true in the electrical industry, where the steadily ascending curve of expansion and development points continually to the fact that the process of electrifying the world's work has but started.

What is the electrical manufacturer to do, however, when he sits down to consider the provisions that he must make to meet the demands of this greater market? He is compelled by the utter lack of accurate statistics to lay his plans by guesswork and approximation. What he has done himself he knows. In addition, he can keep advised of the growth of the light and power industry through the pages of the ELECTRICAL WORLD. He may have some figures, too, on the output of allied groups of factories in his line. But complete statistics on production, sales and stocks of the commodities he manufactures that embrace the entire industry and the entire nation, or a known proportion of it, are not available. He cannot look back over a record of the years and estimate the trend and gage the status of the market and set a quota for his own production for the coming year that bears relation to known conditions. He is compelled to guess. And the extent of the variance would astonish the industry. The ELECTRICAL WORLD annually obtains from the best informed executives of the important lines of electrical manufacture their estimates of the expected total production in each commodity for the coming year. These figures differ sometimes by 50 or 100 per cent. Because of the lack of comprehensive statistics these men cannot avoid guessing wrong.

The need for such industry statistics has long been discussed among electrical manufacturers. This need is acknowledged, but the fear lives in many places that competitors would benefit, and so the manufacturer stands in a false light of appearing to prefer to remain in ignorance himself rather give common information to a rival. Yet this is not the natural attitude of the electrical manufacturer at all, as witnessed by the constructive progress he has made through recent years by harmonious co-operation and association work.

There are two ways to accomplish the desired end legally. These statistics may be gathered by a trade association and submitted to the United States Department of Commerce for official publication, or they may be published in the ELECTRICAL WORLD as public information. Clearance through the government is naturally beset by embarrassing doubt as to who may follow Herbert Hoover in future years. No such doubt exists in the other case, because the ELECTRICAL WORLD is an institution of the industry itself and can compile the statistics of the manufacturer with the same accuracy and in the same strict confidence that it has for years exemplified in gathering and analyzing the statistics of the power companies, and it can publish them as news rather than as history. This service has been offered to the manufacturers and is under consideration.

The compelling thought, therefore, should be this—that in an industry where so great an opportunity lies waiting, no man should stand in the way of knowledge. There is market enough for all, and every electrical manufacturer should feel his responsibility to the American public to get ahead more rapidly with the big job of equipping homes, stores, factories and farms. He should not worry about what his competitor may find out; rather he should desire him to know and act more wisely.

Transmission Design Now Formulated

IT HAS taken time to develop real engineering design principles for transmission lines, but the advent of higher voltages and bitter past experiences have brought about recognition that the transmission line requires the same degree of attention as the power station. It is no longer considered a series of poles or wires with a conductor stretched across; it is conceded to be a real engineering structure designed within very close limits to meet specified mechanical, electrical and economic conditions. The tower structures are designed to meet a given bending moment and shear with a specified factor of safety, and from the many particular designs which can be had to satisfy a given set of conditions the selection is made on the basis of maximum economy considering the line as a whole.

The electrical features of transmission-line design, however, are subject to rapid changes and many variations in service requirements. The voltage of a line has been determined in the past either through consideration of existing interconnected lines or by choosing the maximum possible value. The effect of corona is very marked when high voltages are used, and it becomes necessary to choose a size and type of conductor and a spacing which will bring corona effects within predicted limits. The usual economic solution for line conductors based on resistance losses must be modified considerably should this conductor introduce corona losses of appreciable magnitude. Thus a knowledge of corona-forming conditions is an essential to high-voltage transmission-line design, and although in some cases it may be economical to permit appreciable corona losses, their value should be predetermined.

A little consideration shows that there develop many new factors which must be considered in the intelligent design of lines, and it speaks well for the art that a quantitative and definite design now can be made.

Public Convenience and Company Efficiency Served

ERECTED at a cost of about $125,000, including land and equipment, the new meter building of the United Electric Light Company at Springfield, Mass., is a worthy addition to the fine-looking business structures occupied by this progressive central-station company, notable among New England utilities for the care given its physical property. The meter building is in the outskirts of Springfield adjacent to the company's general service building and is 150 ft. x 52 ft., being designed to permit the addition of a second story to be added in the future.

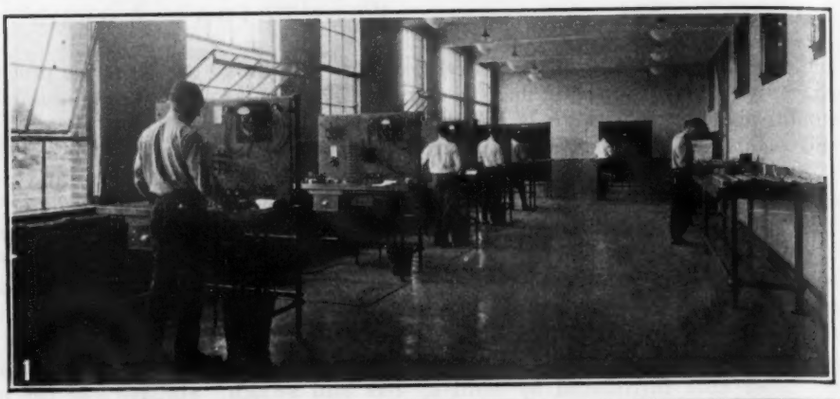
On the first floor are a general office, superintendent's office, laboratory (18 ft. x 40 ft.), meter-testing room (18 ft. x 56 ft.), meter storage, repair and reporting rooms, the basement containing commodious locker and lunch rooms for men and women, battery, repair, switchboard, photometer and high-tension test rooms completed or to be fitted up in the near future. At the rear is an inclosed night parking section for seven departmental cars, and an electric sign (double-reading) with 740 10-watt lamps surmounts the roof. There are 37,000 meters on the system and thirty-one meter department employees under Superintendent J. Frank Murray, who is responsible for the general layout of the building.

No. 1. North light, six States panels and two polyphase panels, all wired in conduit from below and provided with green table tops of battleship linoleum are features of the meter-test room. Artificial illumination is by fourteen 200-watt lamps with Holophane filter-light shades.

No. 2. Meter-storage racks, each holding 620 5-amp. instruments or equivalent. Aisle spacing is 5 ft. and meters are 10 in. apart on centers, horizontally and vertically.

No. 3. Closed-in night parking section, with fireproof doors locking from inside and general fireproof construction. A concrete platform on the left, 50 ft. x 5 ft. and 42 in. above the automobile floor, facilitates transporting meters by hand trucks and otherwise. A 2,000-lb. Bay State electric elevator connects with the basement at the extreme left. Three 150-watt lamps serve the parking area.

No. 4. Pleasing and dignified exterior emphasizes importance of meter department in company affairs.



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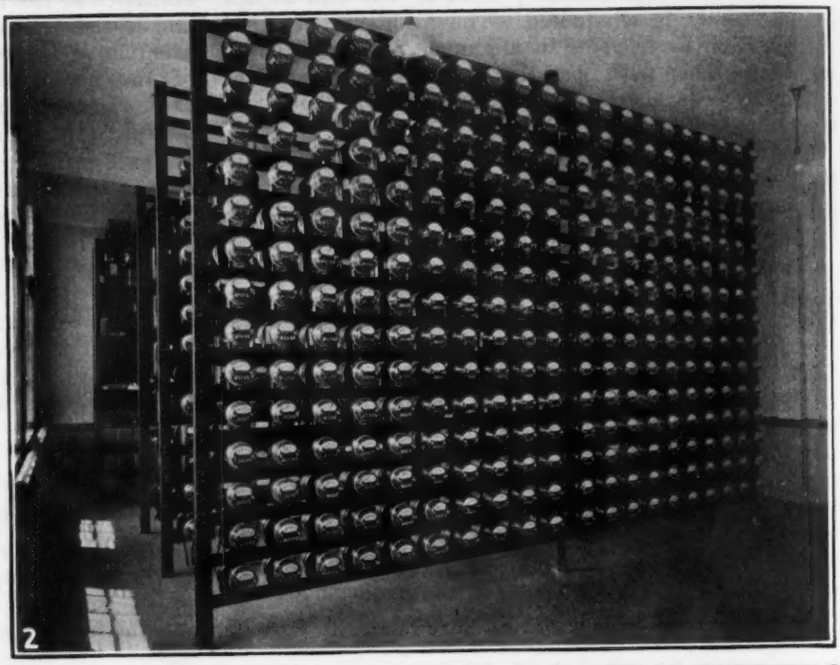

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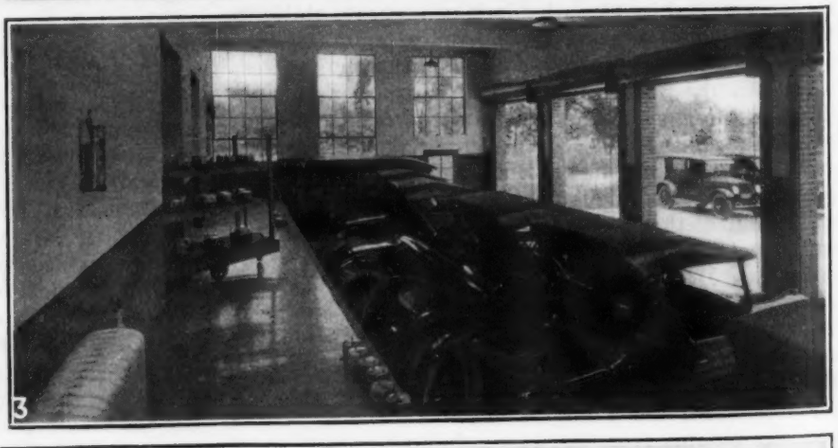

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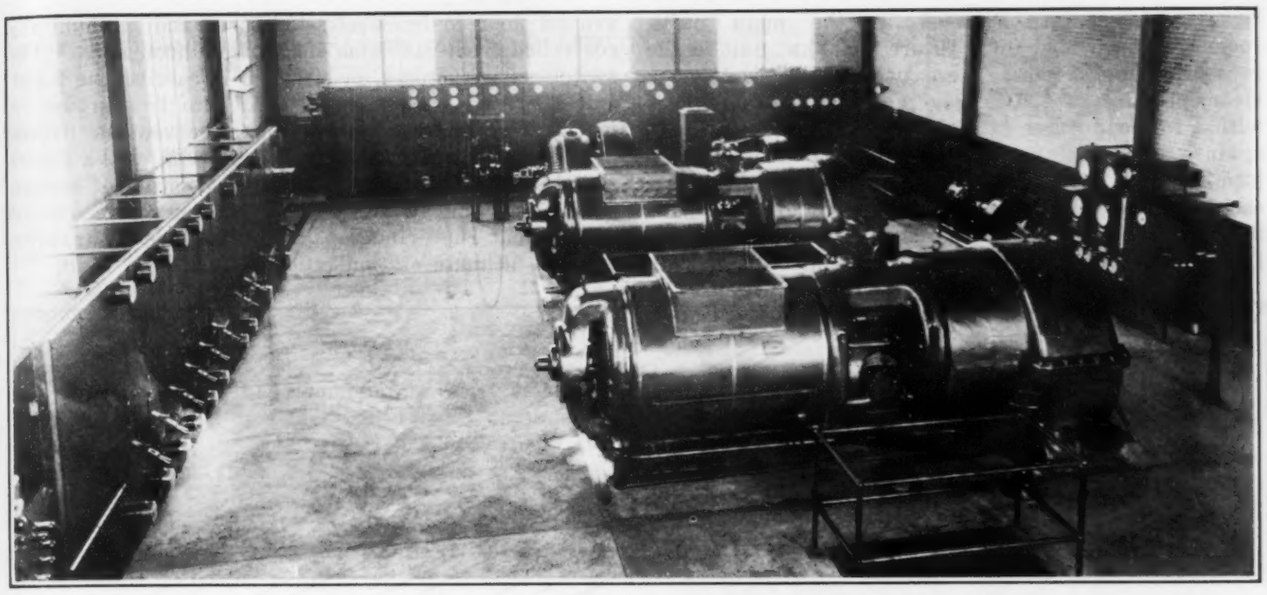


TWO 2,000-KW., 2,300-VOLT TURBO-GENERATORS AND VIEW OF SWITCHBOARDS

Station Fired with Oil and Coal

Simplicity, Economy and Operating Convenience Three Main Governing Factors in the Design of 8,000-Kw. Plant for Sedalia, Mo.—Details of the Installation—Operating Methods Outlined

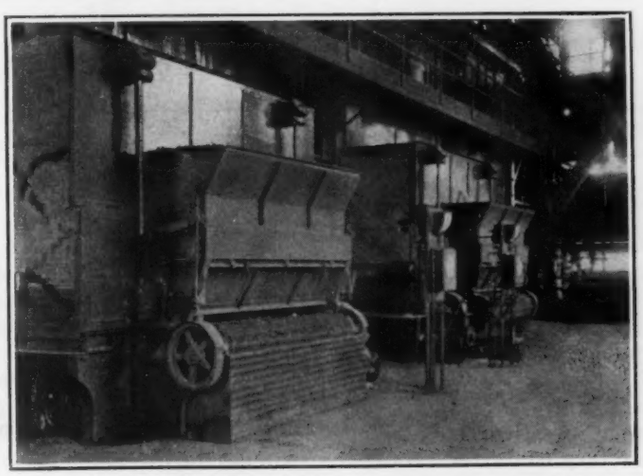
By E. J. BURGER

General Superintendent City Light & Traction Company, Sedalia, Mo.

THE City Light & Traction Company, a utility supplying transportation, electricity, ice and gas to Sedalia, Mo., and a subsidiary of the Cities Service Company, has recently constructed and placed in operation a new and modern steam generating station which will ultimately be rated at 8,000 kw. Sedalia, home of the state fair and a town of 25,000 inhabitants, is in the center of Missouri's most fertile agricultural district. Both the Missouri, Kansas & Texas and the Missouri Pacific have railroad shops there, and there are several smaller industrial establishments.

The community was formerly served with electric service from an obsolete 2,000-kw. plant on the main line of the Missouri, Kansas & Texas Railroad. This plant was close to its load center. Constantly increasing business, together with the impracticability of expanding the old plant, brought the necessity for a new station. A site was selected adjacent to the old plant, and building operations on the new station begun late in 1922. The principal factors influencing the design of this small station were economy, simplicity and convenience, the saving of labor costs of operation and the desire for a plant that would present an attractive appearance.

The building, made of fireproof materials throughout, is constructed of concrete, steel and brick and is entirely above ground. Its outer walls are constructed of five-color-tapestry medium-rough matte-faced brick and treated with light precast cement blocks. More than one-third the total wall area is in factory-ribbed wire-mesh glass set in steel sash. The turbine-room walls are faced with a buff-colored hard-pressed brick from the roof to wainscot line, below which red-pressed brick was used. The boiler-room and turbine-room roofs are of book tile laid on T-irons, over which is a six-ply tar and gravel roof. Three ventilators provide air circulation through the turbine room. A Whiting crane of 20 tons capacity is provided.



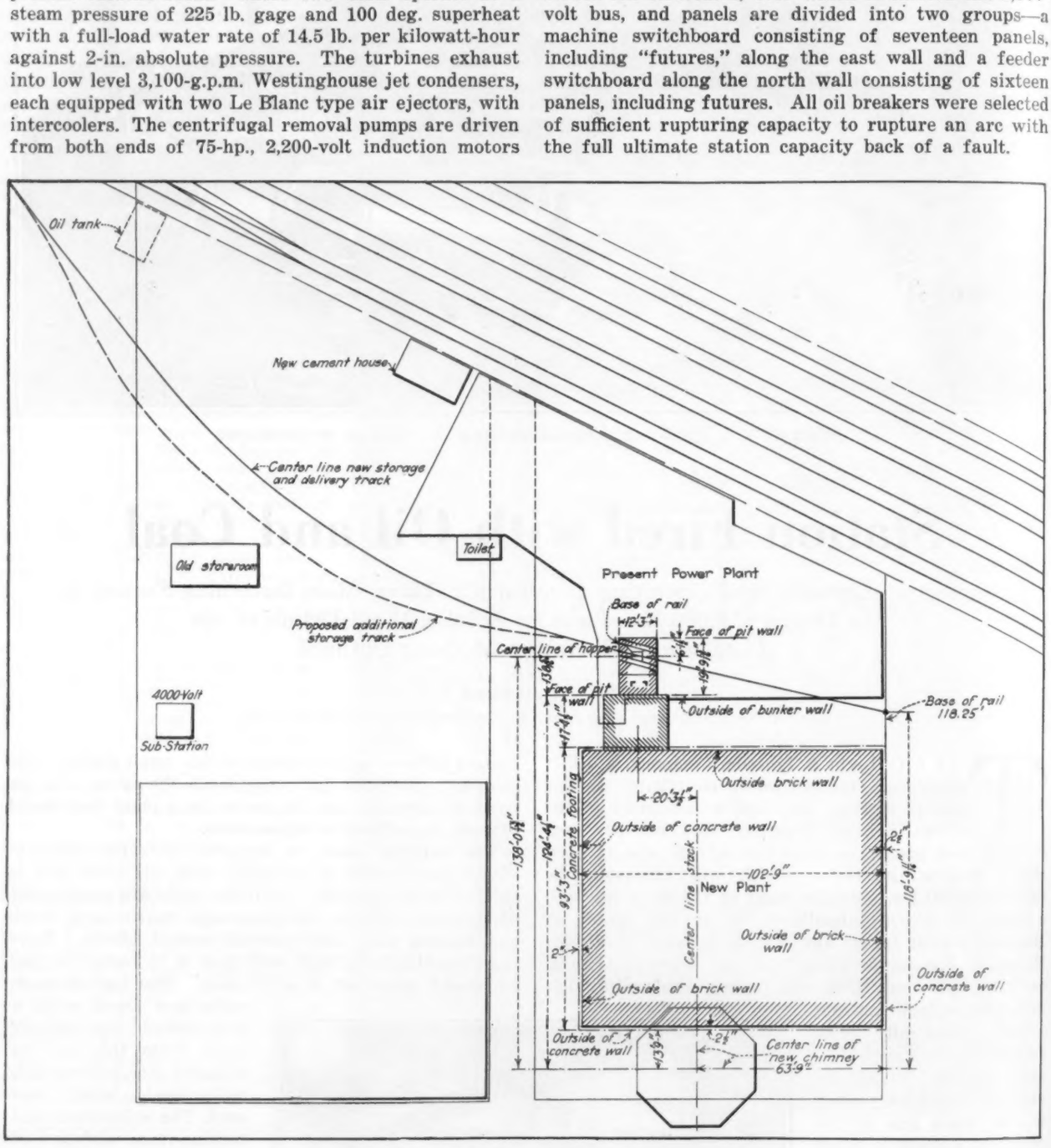
TWO 500-HP. BOILERS HAVE FORCED-DRAFT STOKERS AND ONE BURNS OIL ONLY

The maximum simultaneous demand being 1,800 kw., two 2,000-kw. General Electric 80 per cent power factor, 2,300-

volt turbines were selected as the main units, room being provided for a future 4,000-kw. unit in the present turbine room. These two units operate at a steam pressure of 225 lb. gage and 100 deg. superheat with a full-load water rate of 14.5 lb. per kilowatt-hour against 2-in. absolute pressure. The turbines exhaust into low level 3,100-g.p.m. Westinghouse jet condensers, each equipped with two Le Blanc type air ejectors, with intercoolers. The centrifugal removal pumps are driven from both ends of 75-hp., 2,200-volt induction motors and 75-hp. impulse-type 3,500-r.p.m. non-condensing turbines through herringbone reduction gears.

Excitation is provided by two exciters—a 50-kw. Westinghouse dual-drive exciter driven from one end by a 76-hp., 2,200-volt motor and from the other end by a type MD steam turbine and a 22.5-kw., 2,300-volt motor-generator set. The electric street railway is supplied by a 300-kw., 550-volt direct-current motor-generator set and a 200-kw. rotary converter arranged to operate in parallel.

The station oil circuit breakers are installed on the ground floor in brick-cell structures and mechanically controlled from panels on the turbine floor above. The switch-cell structures, over which is carried the 2,300-volt bus, and panels are divided into two groups—a machine switchboard consisting of seventeen panels, including "futures," along the east wall and a feeder switchboard along the north wall consisting of sixteen panels, including futures. All oil breakers were selected of sufficient rupturing capacity to rupture an arc with the full ultimate station capacity back of a fault.



PLAN OF PLANT FOR SEDALIA

Room has been provided between the bus-cell structure and the north wall for the future installation of feeder induction voltage regulators. All outgoing feeders are carried underground in lead cables through manholes to an outside steel structure. An auxiliary bus on the outside structure, to which can be connected all outgoing feeders through individual disconnecting switches, is tied through additional disconnecting switches to the main generator bus. Thus the entire feeder bus or any individual cable may be taken out of service and the feeders temporarily supplied by the tie.

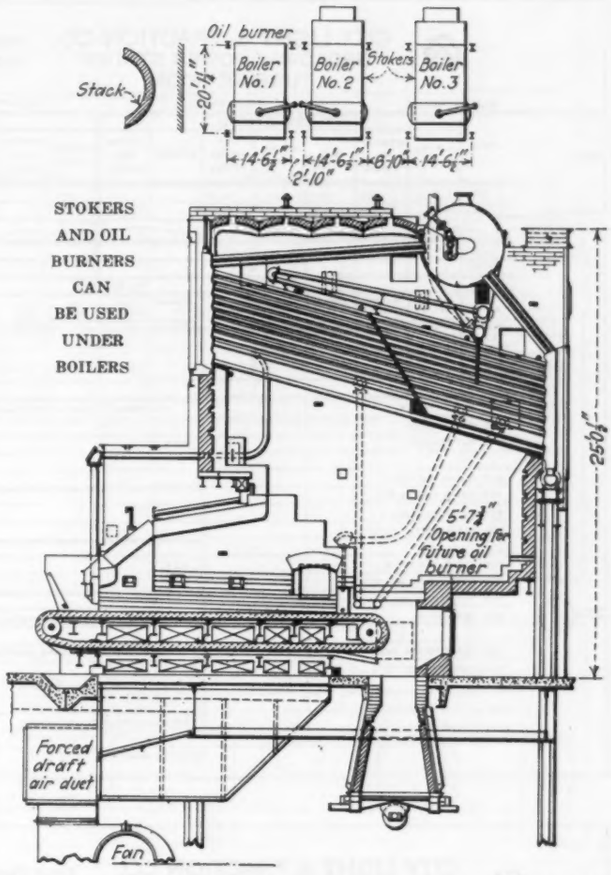
The first group of boilers consists of three 493-b.hp. Springfield cross-drum boilers, each containing 4,930 sq.ft. of heating surface and equipped with the single-loop-type Foster superheaters, and will give approximately 100 deg. superheat at 100 per cent rating. Each boiler contains eleven sections and each section contains seven groups of tubes. Approximately 3 cu.ft. of combustion volume is provided per rated boiler horsepower. Boiler tubes are 3 in. in diameter, except the bottom row, which are 4 in. to provide a slag screen. The front of this row of tubes is 13 ft. 5 in. above the stoker chains.

COMBINATION OIL AND FUEL FIRING

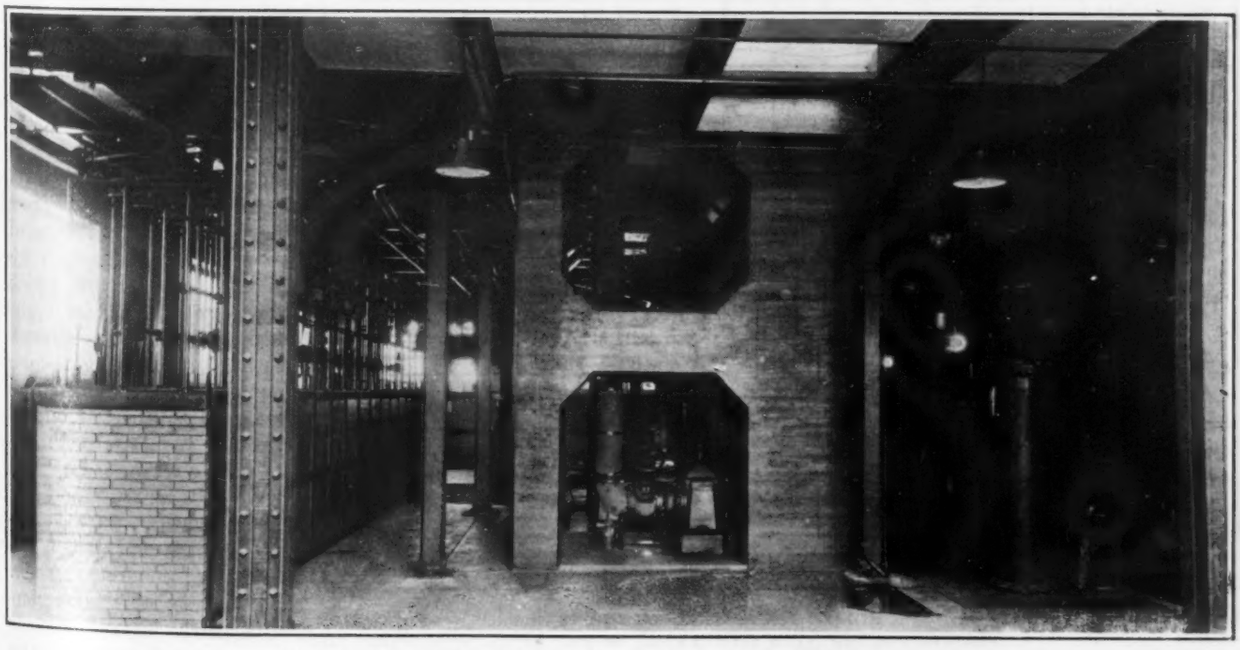
Two of the boilers have combination settings, being fired from the front by Green forced-draft chain-grate stokers and from the rear with oil. Both fuels may be used at the same time. The stokers have an effective area of 104 sq.ft. They are of a five-compartment type and are driven by 220-volt alternating-current variable-speed motors through speed-reduction mechanisms. The stokers were designed to burn typical Missouri slack of the following proximate analysis: Moisture, 15 per cent; ash, 19 per cent; sulphur, 4 per cent; volatiles, 30 per cent; carbon, 34 per cent; B.t.u., 9,566 per pound.

The furnace accessories consist of pressure water-backs, soot blowers, fuel retarders, pressure side-wall tubes and flat igniting arches, each 9 ft. x 6 ft. The third boiler is a straight oil setting with 3.2 cu.ft. volume per rated horsepower and so designed that a stoker may be added later. The boiler-room south wall is of temporary construction to allow for expansion about the center line of the present firing aisle. Draft is provided for the first group of boilers by a Custodis round-column radial brick chimney 250 ft. high by 20 ft. outside, lined 40 ft. Space has been provided for the second chimney to serve the second group of boilers.

Boiler-feed water can be supplied from any one of three sources—condenser discharge, city mains and spray pond. Either of two small electrically operated circulating pumps may be used to elevate the water



from a well in the boiler-room basement to a point 37 ft. above the boiler-room floor, where it passes an auxiliary condenser into which the air ejectors discharge. From this point the feed water gravitates to the main heated deck 14 ft. below, where it can be passed through either of two 1,200-hp. open-type Cochran heaters. The water from the heaters flows by gravity into a continuous recording Bailey V-notch meter or can be shunted through a combination of per-



CONDENSERS AND AUXILIARIES AND FEEDER-SWITCH CELL STRUCTURE

NO. 3

CITY LIGHT & TRACTION CO.
BROADWAY POWER STATION
TURBINE ROOM

DAILY PLANT LOG
ENDING 12 19

CLEANLINESS MAINTENANCE CONTINUITY ECONOMY

TIME	TURBINE NO. 1 HOURS RUN	BEARING OIL DISCH.	VAC.	STEAM FLOW	1ST STAGE PRESS	BAROM.	T. CON. INJ. WATER	TURBINE NO. 2 HOURS RUN	BEARING OIL DISCH.	VAC.	STEAM FLOW	BAROM	1ST STAGE PRESS	T. CON. INJ. WATER
12														
TOTAL AVE.														
TOTAL														

RESULTS

SHIFT	STEAM NO. 1 TURBINE	STEAM NO. 2 TURBINE	STEAM TO AUX.	LOSSES	STEAM TO OTHER DEPTS.	STEAM TO ELECT.	TOTAL @ 1 WATER PER KW. H. W. R.	AVE. VAC. NO. 1.	AVE. VAC. NO. 2.	AVE. VAC. REF. 30"	B. T. U. PER KW. H. W. R.			
12-8														
8-4														
4-12														
TOTAL														

		TURBINE ROOM ATTENDANTS	REMARKS:
AVE. STEAM PRESS			
AVE. STEAM TEMP.			M-G. ON
AVE. SUPERHEAT		12-8	M-G. OFF
AVE. COND. INJ. NO. 1			ROT. ON
AVE. COND. DISCH. NO. 1			ROT. OFF
AVE. TURB. EXH. NO. 1		8-4	
AVE. TERM. DIFF.			
AVE. COND. INJ. NO. 2		4-12	
AVE. CON. DISCH. NO. 2			
AVE. TURB. EXH. NO. 2			
AVE. TERM DIFF.		OVERSPEED NO. 1 TURBINE TESTED	
AVE. PUMP PRESS NO. 1		OVERSPEED NO. 2 TURBINE TESTED	
AVE. PUMP PRESS NO. 2			
		END BELLS NO. 1 TURBINE REM.	
		END BELLS NO. 2 TURBINE REM.	

SIGNED SIGNED

RESULTS ENG. PLANT SUPT.

NO. 4

CITY LIGHT & TRACTION CO.
BROADWAY POWER STATION
BOILER ROOM

DAILY PLANT LOG
ENDING 12 192

CLEANLINESS MAINTENANCE CONTINUITY ECONOMY

SHIFT	OIL MET. BEGIN. OF SHIFT	OIL MET. END OF SHIFT	GALS. OIL OR LBS. COAL FIRED	V-NOTCH BEGIN. OF SHIFT	V-NOTCH END OF SHIFT	LBS. WATER TO BOILERS	LBS. STEAM GEN. ERATED	BLOW DOWN & LOSSES	B. T. U. INPUT	B. T. U. ABS. BY STEAM	LBS. WATER PER LB. COAL OR GAL. OIL	% BOILER EFF.	F. W. TEMP. AVE.	FLUE G TEMP. AVE.
12-8														
TOTAL														

CONDITIONS

TIME	STEAM TEMP. NO. 1	STEAM TEMP. NO. 2	STEAM TEMP. NO. 3	F. W. TEMP.	OIL TEMP.	FLUE GAS TEMP.	STEAM PRESS	CO2	T. OF WATER TO HEATER
12									
1									
11									
12									
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
AVE.									

FUEL SHIPMENTS

CAR NO. AND INITIALS	DATE RECD.	DATE UNLOAD.	SAMPLED

BOILER ROOM ATTENDTS

SHIFT	
12-8	
8-4	
4-12	

BOILER	ON	OFF	HOURS RUN	HOURS BANKED
1				
2				
3				
FEED PUMPS				
1				
2				
LIFT PUMPS				
1				
2				

OIL ON HAND 12 YEST.		COAL ON HAND 12 YEST.	
OIL RECEIVED		COAL RECD.	
TOTAL		TOTAL	
OIL DISPOSED OF		COAL DISPOSED OF	
OIL TO BOILERS		COAL TO BOILERS	
OIL ON HAND 12 TODAY		COAL ON HAND 12 TODAY	
B. T. U. PER GAL.		B. T. U. 1 LB. COAL	
METER CORR. FACTOR		KIND COAL FIRED TODAY	

REMARKS:

GIVE REASONS FOR WIDE VARIATION IN ECONOMY

SIGNED SIGNED

RESULTS ENG. PLANT SUPT.

BOILER AND TURBINE ROOM OPERATING LOG SHEETS ARE ADAPTED FOR USE WITH EITHER COAL OR OIL FUEL OR THE TWO IN COMBINATION

manent weigh tanks on a deck 13 ft. below the feed-water deck and 10 ft. above the boiler-room floor. The water is handled to the boilers by either of two 10-in. x 6-in. x 12-in. reciprocating steam pumps on the boiler-room floor through one of two complete sets of feed-water headers.

The high-pressure steam header is installed just below the boiler-room floor and parallel with the turbine-room basement parting wall. An auxiliary header is also provided, and all is arranged so that one boiler and one turbine may be isolated from all other steam load. This arrangement provides a permanent means of checking prime-mover water rates by weighing feed water to the boilers.

Coal and Ash Handling

Coal is moved into the plant siding in hopper-bottom cars and dumped into an underground hopper, from where it is elevated to a combination overhead ash and coal bunker by means of an Alvey Ferguson automatic loader and skip hoist. The overhead bunker has a capacity of 150 tons and is so designed that coal may be spouted into a boiler-room power-operated traveling weigh larry or into a storage pile. Coal so stored is reclaimed by means of a drag conveyor back to the track hopper.

Ashes are dumped from the ash hopper by means of air-operated gates into industrial cars, from which they are spilled into the skip hoist and thence elevated to the ash compartment of the overhead bunker, to be reclaimed through spouts.

Cooling water is supplied from a spray pond of approximately 3,000-gal.-per-minute capacity. The pond is of concrete, 100 ft. x 120 ft. x 4 ft. and contains three spray headers each containing six groups

CITY LIGHT & TRACTION CO.
BROADWAY POWER STATION
FEEDER SWITCH BOARD

DAILY PLANT LOG NO. 1
ENDING 12 19

CLEANLINESS | MAINTENANCE | CONTINUITY | ECONOMY

	KATV									COMM. POWER			ARC NO. 1	ARC NO. 2		FLAT RATE	COMM. EAST	COMM. WEST	EAST LIGHTS	WEST LIGHTS	SO. LIGHTS	
	A	B	C	A	B	C	A	B	C	A	B	C										
12																						
1																						
12																						

WATT HOUR METERS

12														
8														
4														
12														
KWH														

ARC NO. 1 ON
ARC NO. 2 ON
FLATE RATE ON
ARC NO. 1 OFF
ARC NO. 2 OFF
FLAT RATE OFF

REPORT FEEDER OUTAGES:

SIGNED RESULTS ENG.

SIGNED PLANT SUPT.

CITY LIGHT & TRACTION CO.
BROADWAY POWER STATION
MACHINE SWITCH BOARD

DAILY PLANT LOG NO. 2
ENDING 12 19

CLEANLINESS | MAINTENANCE | CONTINUITY | ECONOMY

TIME	GENERATOR NO. 1				GENERATOR NO. 2				K.W. LOAD	STA. AUX. AMPS.	EXC. NO. 1 AMPS.	EXC. NO. 2 AMPS.	M. G. SET R. F. M.	ROT. R. F. M.	D. C. BUS VOLTS	A. C. BUS VOLTS
	A AMP	B AMP	C AMP	RPM	A AMP	B AMP	C AMP	RPM								
12																
1																

WATT HOUR METERS

	GEN. NO. 1	GEN. NO. 2	STA. AUX.	HOUSE TRANS.	EXC. NO. 1	EXC. NO. 2	M. G. SET	ROTARY CONV.
12								
8								
4								
12								

GENERATION

	SHIFT 12-8	SHIFT 8-4	SHIFT 4-12	TOTAL
GEN. NO. 1				
GEN. NO. 2				
GROSS GEN.				
STA. AUX.				
HOUSE TRANS.				
EXC. NO. 1				
EXC. NO. 2				
USED IN PROD.				
NET PROD.				
ROTARY CONV.				
M. G. SET				
OTHER DEPT'S				
USED BY CO.				
NET TO FEEDERS				
FEEDER METERS				
DIFF.				
% DIFF.				

REMARKS:
AVE. LOAD FACTOR
MAX. DEMAND

SIGNED RESULTS ENG.

SIGNED CHIEF ENG.

ELECTRICAL OPERATING LOG SHEETS

of five nozzles. The pond is so constructed as to allow for future expansion as required.

Panels are provided for each of the boilers, and on them are mounted instruments for measuring and recording steam flow, air flow, flue-gas temperature and multi-pointer gages for measuring pressure and draft through the boiler and wind compartments. Turbine panels are equipped with recording and integrating Bailey steam-flow meters with steam temperature pens, two pen temperature recorders for recording condenser injection water and exhaust steam, and with vacuum gages, barometers and other instruments usual to the operation of turbines. Other instruments are installed to record feedwater temperature, exhaust header pressure, feed water flow and CO_2. Indicating instruments are provided throughout to check all the recording instruments in the plant.

Although construction work on the plant was not completed until early in 1924, the first unit was placed in operation in August, 1923. Construction work was supervised by V. H. Yarnall of the construction department of Henry L. Doherty & Company, New York, which is headed by G. W. Saathoff.

The entire operating organization with the plant on a coal-burning basis consists of a plant superintendent, a results engineer, three shift engineers, three firemen, a maintenance man and two helpers. Eleven men operate and maintain the plant. Detailed records are kept of daily operations. The usual unwieldy plant log record has been replaced with five 8½-in. x 11-in. sheets on which are recorded complete data for computing boiler efficiency and B.t.u. per net kilowatt-hour output for each shift. The boiler-room results showing under the name of each fireman are posted daily.

The Sedalia company is managed and operated by H. C. Feuers, vice-president and general manager; E. J. Burger, general superintendent, and N. G. Neal, power-plant superintendent.

Acquiring and Preparing Right-of-Way

Suggestions Which Experience Has Shown Are Worth Heeding in Selecting Route, Surveying and Marking for Line Supports, and Establishing Co-operation Between Right-of-Way Man and Construction Superintendent

By MILTON H. WAGNER
Manager Electrical Department, Charles M. Kelso Company, Inc., Dayton, Ohio

THE interconnection of large and small systems, which is increasing because of the demand for a greater continuity of service and greater diversity of generation and use of electricity, necessitates that the construction of these lines be as durable and permanent as economy will permit. Furthermore, considering the ultimate importance of lines of this character, the ownership of the right-of-way must be in the name of the operating company. With such ownership the line will not have to be relocated until such time as the particular demands for service dictate the necessity.

After back-tracking the lanes of experience, it will usually be found that a hit-or-miss program has been followed in securing transmission rights-of-way, and there is a great variance of opinion regarding the value of right-of-way grants if it is measured merely by the money transaction. It is also unfortunate that some farmers along the routes of transmission lines band together and present a concerted "bloc" against acquiring right-of-way privileges at reasonable prices. With this situation before the utilities, it is well to consider some of the essential steps in obtaining rights-of-way.

STRAIGHT, ACCESSIBLE ROUTES AWAY FROM CONGESTION DESIRABLE

Great care must be exercised in the selection of transmission line routes so that the line will be as straight as possible, yet removed from the congested areas in which the right-of-way expense would be too great. The line must be so located as to permit periodic patrolling, remembering that weather conditions might greatly alter accessibility in times of emergencies, which unfortunately occur during severe weather.

Highway Rights-of-Way.—Quite often it is desirable to have the right-of-way near a paralleling highway. In seeking such a right-of-way on the property side of the fence, difficulties are sometimes encountered because the power company must definitely establish the property line, which is quite often not the same as the fence line established by the farmer. Should the farmer insist that his fence line is on the property line, great difficulty is encountered in securing a right-of-way which would permit locating the poles or structures within the property line as determined by the county records. Many times, especially after the use of the road has been increased by automobile traffic, the state officials extend the roads to their full width. If this is done, it is easy to see just what the difficulty would be if a pole line or tower line were built on the road side of the property line.

Another phase of this problem arises when inadequacy of highways demands widening the road even beyond the property line. Because of the great expense and inconvenience to the operating company which such a change would entail, any utility running a line along a highway must give forethought to the probability of having to widen the highway. Among other objections to highway rights-of-way are the presence of telephone lines which have grown up like Topsy and shade trees on which the farmers place unlimited value.

On the other hand, highway rights-of-way have the advantage that they facilitate the delivery of construction and transmission-line equipment. Another advantage is the fact that future local distribution lines can be carried on the same poles without additional expense for supports. This is of great value, considering the ultimate use of electricity in rural districts.

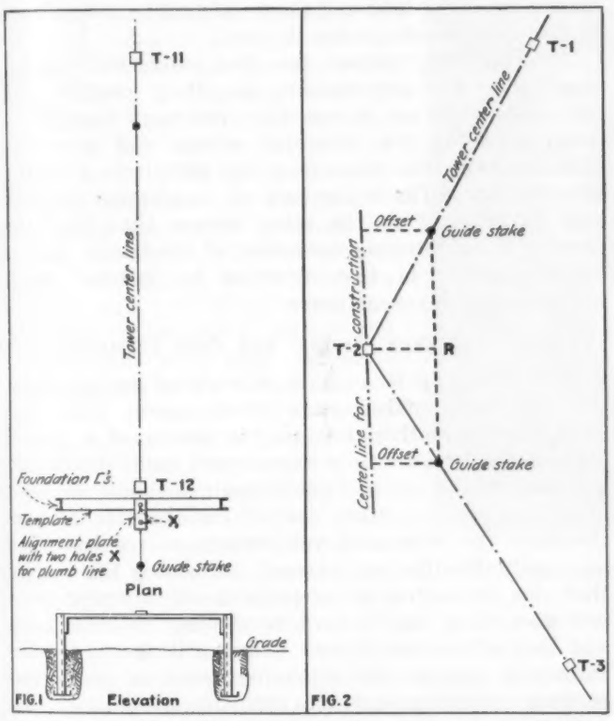
Rear-Line Rights-of-way.—Many of the foregoing objections to highway rights-of-way can be overcome by constructing the transmission line on the rear lines of property, but other problems are introduced, such as requiring the erection of poles and structures so that the overhang of the poles or towers will fall within the property line. Furthermore, farmers sometimes object to such rights-of-way because of the difficulty of plowing around any structure placed in the fields. Objection to placing the transmission-line supports adjacent to a fence is sometimes raised on the ground that the livestock will attempt to crowd between the support and the fence and quite often cause trouble. Rear-line rights-of-way necessitate the hauling of construction material and equipment over cultivated fields, which is an additional disadvantage. The real advantage of locating a transmission line in such a position is that such rights-of-way are easier to obtain from farmers than where the transmission line runs in front of their property.

COST OF RIGHT-OF-WAY VERSUS COST OF CONSTRUCTION

Before purchasing a right-of-way for any line it is well to select two routes for the line for reasons of strategy which may have to be resorted to before the completed right-of-way is purchased. When this precaution is taken any attempt of a combination of property holders to demand excessive values for rights-of-way can be more easily circumvented.

While the cost of the land through which the line is to be routed is a very important consideration, it may be offset in some cases if the selection of a cheaper right-of-way would require a line with many angles and expensive line supports, since these not only increase the investment in transmission-line material and the cost of erection but reduce the ultimate strength of the line. As every one who has built and operated transmission lines knows, the ultimate desire in selecting a route is to obtain one which will make good service possible not only in the beginning, but in the operation and maintenance of the line. The interest on the investment in the right-of-way and the transmission equipment must be balanced against the annual operating and maintenance charges.

Since the description and construction of a large portion of wooden-pole transmission lines can be made without a center-line survey, the degree of refinement obtained by such survey is not maintained in the construction of the line. As soon as the pole hole is dug the setting of the pole can be completed by aligning it with the eye. Where the contour of the country is rolling, however, it will be found advantageous to make a center-line survey of that portion of the transmission route. With the aid of the contours thus obtained it is possible to chart the pole locations and determine the height of line supports necessary to obtain a well-graded line. The spans can be chained and the center line of the route determined by the use of flags or pike poles.



ALIGNMENT OF TANGENT TOWER AND SETTING ANGLE TOWER TO BISECT ANGLE

Fig. 1—In setting tower footing the template with plate is belted to tower footing. Two plumb bobs are suspended from holes *XX* so they will hang over chalk line between tower stake *T*12 and guide stake.

Fig. 2—Guide stakes are established on the center lines of intersecting tangents equidistant from *T*2. Stretch a line between guide stakes and measure right angle distance to tower stake *T*2. using this length with guide stakes as center to locate new center line for construction.

In the case of a tower line, however, the cross-section of the tower at the ground line is so great that it is advisable to run a center line throughout the entire route in order that the tower footings may be installed in a way to insure their alignment. This operation is greatly simplified by establishing center lines of all towers in a tangent with one set-up of the transit, instead of by using a set-up on each tower center. Then a tower-location stake can be driven at each tower location and an additional stake, termed a "guide stake," driven at another point in the center line, not far from the tower location, to permit setting the tower with cross-arms at right angles to the line. With these guide stakes and a template which can be bolted to the tower footings, assurance can be had that the tower will be set with the cross-arms at right angles to the line (see Fig. 1).

When an angle tower is to be located the guide stakes can be set on the center lines of the intersecting tangents at equal distances from the tower stake, which will permit bisecting the angle and thus setting the tower with proper relation to the line (Fig. 2).

In pole or tower-line right-of-way agreements it is better to describe the center line with respect to local established markers, giving the number of poles or towers across the property, than to attempt to give the bearings and the exact location of each pole or structure. This will permit a certain desirable flexibility in the final location of the line supports and will include all the data necessary for the legal description of the right-of-way.

AFFABILITY, FAIRNESS AND TACT NECESSARY

To acquire the right-of-way after the route is determined is the real problem. The selection of a right-of-way man is no simple task, for he must be affable, absolutely fair, able to inspire confidence, tactful and ready to do anything within reason to establish his company firmly in the confidence of the farmer. The attitude which these prerequisites imply must be maintained throughout all future dealings between the farmer and the utility.

A large part of the right-of-way difficulties which have been experienced in the past has been due to the fact that the central-station companies have never properly recognized the importance of the right-of-way man. It is unfortunate that so many operating companies have felt that any one could buy right-of-way. On the contrary, right-of-way purchasing really needs a knack. The right-of-way man must firmly understand a good portion of the construction and operating difficulties, in order that after negotiations have been made all right-of-way privileges will be properly included in the right-of-way grant. He must also be careful in making any promises to farmers which as compensation for the privilege sought might be considered more valuable than the money involved. Any special concession which is made by him must be considered as a personal obligation and kept in mind until it is fulfilled. Great harm has been done to electric utilities by incompetent right-of-way men, and damage done by them makes itself felt in future transactions as well as those under way.

Another very important fact to be remembered is that farmers have such close contact with one another that news regarding individual transactions is immediately passed along to all farmers who may be approached for right-of-way grants and the operating company may be held up for greater compensation on succeeding grants. The basis of payment for right-of-way should be liberal and fair, and a special effort should be made to maintain a unit price throughout the route. Special compensation can be made for additional privileges, but in no case should the impression be left that the unit price has been changed to a higher rate. If this precaution be not taken, some farmers will believe that higher compensation can be obtained by holding out, and the difficulty of closing subsequent right-of-way agreements may become so serious as to require court proceedings. These, of course, should be avoided to the utmost.

Quite often it is necessary to consider supplying rural service along the line. Before any promises to render it are made the operating company must be very careful to ascertain whether compensation for the service will be adequate, because service along a "high

line" is very expensive. Otherwise considerable embarrassment and possibly strained relations may result. Greater compensation for such service can be obtained at the time of line construction than at any other time.

In obtaining right-of-way it is first advisable to acquire options from one end of the line to the other, and these should clearly indicate the important clauses which will be contained in the final agreement. By so doing any great difficulty in executing that agreement will be avoided. Another advantage of obtaining options is the opportunity thereby afforded for examining the titles of the property involved, which in turn is the only possible way of making the final agreement absolutely secure. Any expense necessary in obtaining signatures of witnesses is certainly warranted. Each final agreement, properly executed, should be recorded in the state.

Aërial Clearance Rights.—At the time of purchasing right-of-way it is very essential that the privilege of clearing trees or trimming trees be obtained on some definite basis. This will avoid difficulties during construction of the line. Care must be exercised in determining which trees are to be cut and which are to be trimmed. Good practice would dictate that the trees to be trimmed or cut down be notched in the presence of the landowner and the right-of-way man, thus avoiding misunderstandings. If the trees are to be cut, it is advisable to determine the length of logs or wood that is desired, since by knowing definitely the ultimate disposal of the trees the utility will be in a better position to determine a fair compensation for the privilege obtained. It is very often possible to get the farmer's good will by having him cut the trees to his own satisfaction for definite compensation. The farmer is anxious to net as much return as possible and will usually find it convenient to cut the timber at odd times.

In connection with every right-of-way grant it is necessary to describe specifically the aërial right which is essential to running the transmission-line conductors. In case the right-of-way secured is not wide enough to include the overhang of the cross-arms and conductors, the aërial right is particularly necessary and should be covered in an agreement form just like all other right-of-way privileges. Of course, the compensation for rights to overhang property should be very nominal since the acquiring of aërial rights is only a recognition of the rights of the owner of the land below.

Co-operation of Right-of-Way Man and Construction Superintendent

The right-of-way man must have sufficient jurisdiction over the superintendent of construction to demand co-operation in carrying out all stipulations in the right-of-way agreements. Strict adherence to the stipulations by the construction force will smooth the way for future right-of-way transactions. Care must be exercised to respect the rights of the farmer and avoid damage to property. Where any is done it should be promptly repaired. Damage to fences caused by construction men climbing over them can be reduced by placing fence ladders at points where there is likely to be considerable crossing. These and similar contrivances will assist considerably in gaining the friendship of the farmer. It is a good policy, too, to solicit his help, especially in delivering poles or structures on cultivated fields, because damage caused by his own acts never assumes in his mind the magnitude of that done by others. Particular care should be taken to replace damaged fences, to close gates and to cover holes to prevent stock from being injured. As soon as the farmer raises an objection the construction force should be withdrawn until the right-of-way man has time to correct the situation. The construction superintendent should see that every wish of the right-of-way man is followed to the letter. He should not attempt to work on property for which the final payment is not made unless special permission is granted by the farmer. Above all things, it should be kept in mind that the farmer owns the land and should always be looked upon as the dictator concerning its use.

Unfortunately, farmers feel that public utilities, because they are corporations, are their enemies and consequently do not expect fair treatment from them. Observation of the foregoing advice will gradually eliminate this false impression and substitute a feeling of confidence. The importance of conciliation must be kept in mind if for no other reason than that the farmer is an ultimate consumer of electricity and is being educated in that direction by isolated farm-lighting-plant manufacturers.

Employ "Tree Doctor" for Tree Trimming

Tree trimming is a phase of right-of-way preparation and maintenance work which causes more real grief than any other, because the beauty of a tree is appreciated by all. Only experienced men, thoroughly schooled in the art of tree trimming, should be used on this work. A "tree doctor" can provide greater clearance for wires and yet damage a tree less than any one unfamiliar with trees. Informing the farmer that this precaution is taken to avoid injuring trees will go a long way toward developing his friendship and that of his neighbors. Many utilities have been employing experts for trimming trees in residential sections of cities, and the company with which the writer is connected is insisting on the same consideration in rural territories. It is suggested that utilities enlist the aid of a tree doctor regularly for such work. The ultimate cost of tree trimming should be less when properly carried on by an expert than when carried on by those unfamiliar with the work. It is considered good practice to trim trees for two successive years after a line is installed and after that when necessary. Where promises are made to return the following year to do further trimming, care should be exercised to see that the promise is fulfilled.

In conclusion, attention is called to the great importance of uniformity of practice in the purchase of right-of-way and in the treatment of landowners. The future of interconnection is indissolubly tied up with the methods followed now. With uniformly fair treatment and proper publicity, interconnection can be carried on with little difficulty and a sound foundation established at the same time for good relations when rural service becomes more extensive. Besides, if the farmers are treated uniformly throughout the country so that the impression obtained is one of absolute confidence in utilities, the greatest ultimate investment of farmers' funds in utility stock can be expected. The educational campaign, so successfully started by the isolated farm-lighting-plant manufacturers, must be carried on. Treat the farmers all alike, recognize the fair value of their land and win their absolute confidence. By so doing the greatest return will be derived.

Election's Lesson to Public Utilities

Defeat of Government-Ownership Measures Shows that Sanity and Good Sense of American People Will Prevail When the Issue Is Clearly Drawn and the Voters Are Informed

By FRANKLIN T. GRIFFITH
President of the National Electric Light Association

RADICALISM received its deserts on November 4. Voters on that day dealt it a smashing blow in one of the most encouraging elections that the country has had in many years. Ever since the outbreak of hostilities in Europe the demagogue has sought to traffic in turmoil and strife. Doctrines subversive of American institutions received wide circulation, and those preaching them grew bolder and more reckless when legal restraints were removed after the signing of the treaty of peace. This revolutionary menace was, of course, foredoomed to defeat, for America will never become red; but along with it grew up a more insidious movement looking especially toward inducing the people to demand that the nation, states and municipalities take over and run the public utilities of the country.

FRANKLIN T. GRIFFITH

Encouraged perhaps by the partial success of the farm bloc in Congress and hoping to extend radical sway over the country by a bold stroke, the advocates of government ownership on November 4 submitted their cause to the judgment of the people. The issues were clearly presented. It was the first time in the history of the country that there had been a nation-wide opportunity for the voters to pass on this question, and they met the issue squarely and resolutely.

As president of the National Electric Light Association, I took occasion in September on my visit East to draw the attention of electric public utilities to the menace which confronted them in the program of the third party. I told them that one of the planks in that party's platform was: "We believe in the complete development of all hydro-electric current in this country by the national government. We believe in trunk systems operated by the government, financed by the government, and selling to municipalities throughout the nation."

THE MENACE TO UTILITIES

I said at the time that this would mean the destruction of private operation of electric public utilities in the United States, and while this threat was not serious in the eastern section of the country, in the Far West, and particularly on the Pacific Coast, it was very real. In California, for example, there was the resubmission by initiative of the water and power act, while in the State of Washington the initiated measure known as the Bone bill was referred to the voters. The latter was intended to give cities and towns the right to purchase and sell electrical energy inside and outside their corporate limits and to acquire or construct electric generation, transmission and distribution systems. The former would have bonded the State of California for $500,000,000 with which to engage in hydro-electric development.

Both measures were defeated, and in all likelihood the radical propaganda, with all its extravagant claims of public benefit from government ownership and operation, will abate somewhat because its prophets have been discredited. However, we of the electric light and power industry must still demonstrate the superiority of private ownership under government regulation and must still bend all our energies to win, through the excellence and reasonable cost of our service, the good will and approval of the public everywhere.

Most attacks on the electric light and power companies are similar to those just defeated in California and Washington. People are asked to believe that government can do more for them than they can do for themselves. This shows clearly the importance of the work of the National Electric Light Association in public relations. There has always been so much mystery about electricity that people are prone to associate mystery with the electric public utility business, whereas there is nothing mysterious about the business at all. And yet we don't seem to make the people whom we serve, and whom we honestly delight to serve, know the facts. This is just as much a part of our job as the supply of electricity itself.

If, therefore, the recent election indicates anything, it is, first, the maintenance of faith in the industry as it is now conducted and, second, the desirability of greater information concerning it. The obligation rests with us, then, to acquaint the people of the whole country with the inwardness of public service. Give them the facts and let them be the disseminators. Enhance public relations not only by the character of the service rendered, but build it on the character of the men engaged in the business. Let the public see and know that we are fundamentally honest, that we possess skill and intelligence of a high order, and that we purpose to conduct our business on such a high plane as to challenge comparison and merit commendation.

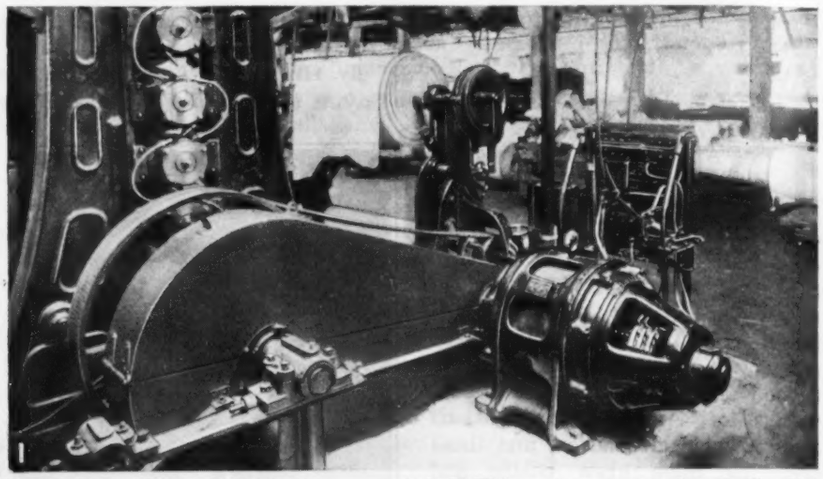
Dual-Frequency Super-Calender Drive Increases Production 25 per Cent

UNTIL recently the driving of super-calenders by electric motors has been handicapped by the necessity of a large gear reduction or by the use of a separate motor and overrunning clutch for obtaining the so-called "threadin'-in." speed. The operation of super-calenders is a skilled art, and while ordinarily only the "threadin'-in" and "running" speeds are required, at times it is very desirable to run at intermediate speeds so that the calender can be slowed down for bad or weak spots in the sheet. Normally the "threadin'-in" speed is about one-tenth the running speed.

In the installation illustrated, which is at the plant of the Kalamazoo (Mich.) Paper Company, nine super-calenders were equipped some months ago by the Westinghouse Electric & Manufacturing Company with a new "dual-frequency" drive, and as a result production has been increased 25 per cent, with other advantages. In this new drive both the "threadin'-in" and "running" speeds are obtained from a single motor through a single gear or chain reduction to the lower calender roll, reducing the complication and saving space over the old engine-driven line-shaft arrangement. Now a frequency-changer set reduces the primary voltage and frequency to about 10 per cent of their normal value, and this reduced frequency and voltage when applied to the driving motor produces the required "threadin'-in." speed. The motor is designed with high starting torque at low frequency and has smooth acceleration, thus avoiding paper breakage.

Among the advantages of the dual-frequency drive are greatly increased production and flexibility, elimination of noise and decreased lighting cost from the removal of belts and shafting. The control is simple to handle and can be installed at the most convenient place. In the old type of drive all parts are fixed and cannot be shifted to suit local conditions. Through the handling of the installation work by W. H. Scott, chief engineer of the Kalamazoo company, and his assistants, the change from the old belt drive to the dual-frequency equipment was accomplished without loss in production.

1. Old method of super-calender drive by geared motor.
2. A 75-hp. motor driving a super-calender through Link belt connection, marked space economy being an advantage.
3. Frequency-changer set for nine calender drives at Kalamazoo.
4. Side view of calender stack showing 75-hp. driving motor, chain drive, control panel and drum controller. A stop push-button station permits shutting down the unit at any moment.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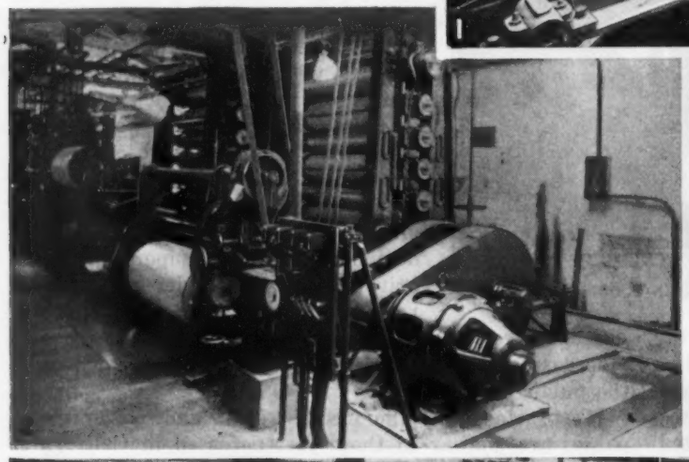
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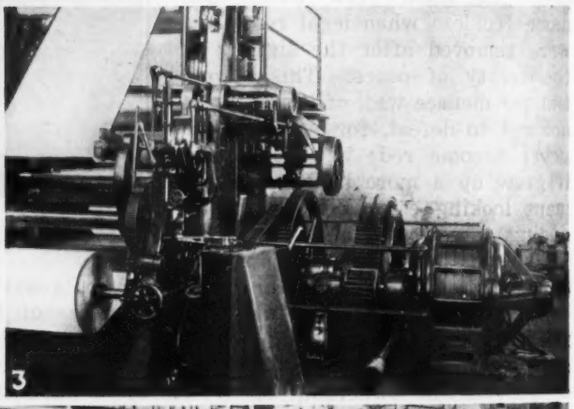
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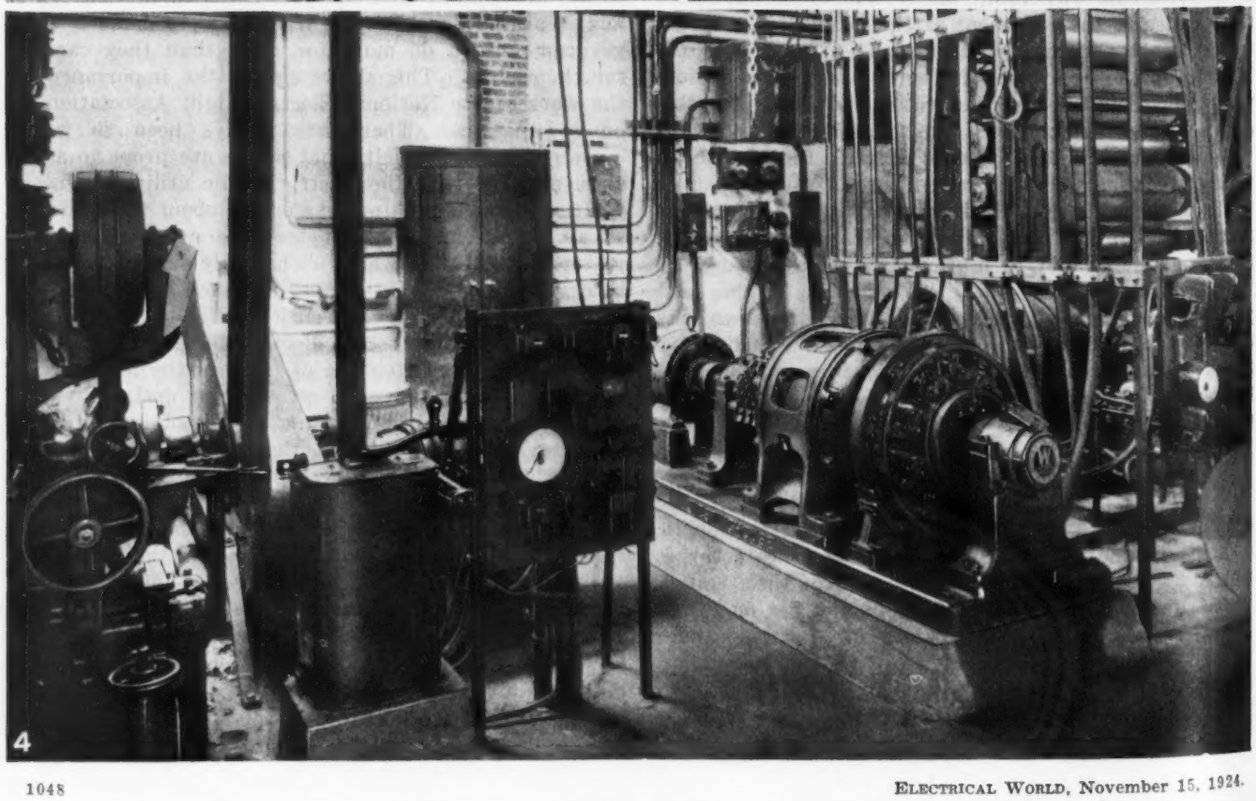
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Facts Versus Fancies in the Meter-Service Switch Question

Development of Many Years Has Led to a Degree of Standardization Worth Much to the Industry—Further Development Is Desirable and Probable—Circuit Breaker Has Possibilities—Present Facts Should Not Be Ignored

By JOSEPH SACHS
Chief Engineer Johns Pratt Company, Hartford, Conn.

THE meter-service switch problem is an old one, but the art and practice have advanced materially in recent years. Yet it is always a point of discussion. In offering this paper I want at the outset to emphasize that the arguments advanced and the conclusions which may be reached are not due to any engineering, manufacturing or merchandising bias. Partiality is poor business policy and 100 per cent acceptance of anything is practically impossible. Believing this to be true, the company with which I am affiliated manufactures meter-service switches incorporating the accessible "main-fuse-when-dead" principle, as well as those with the sealed-fuse feature. When circuit-breaker development has reached a stage promising success in actual service, a standardized device of this type will undoubtedly also be offered. Ultimately, the fittest will survive. Let us be fair in striving for survival and concede merit where merit exists.

Fundamental Requisites

A switch embodying all meter-service essentials must provide safety service-load control functioning, effect maintenance economies for the utility, and (unless dominant installation practice is radically changed, as seems unlikely) should be adapted for simple and inexpensive installation by the consumer's contractor. The three principal requirements set forth in a recent article in the ELECTRICAL WORLD by Messrs. Fryer and Gregory (ELECTRICAL WORLD, May 17, 1924, page 1003) may be accepted but somewhat differently stated, as:

To insure safety: By protection against personal and property hazards at *all* times.

To serve for all essentials: By providing means for manual and automatic load controlling under normal and abnormal conditions, for efficient and economical meter maintenance (including testing), and for protection against tampering and use of unmetered energy.

To provide economical installation and service: By inexpensive complete installation cost and economic adaptation to established meter-service policies and practices.

Safety Comparisons

Insuring safety involves more than mere inclosure against contact with live parts and confinement of arcing. Complete safety can be maintained in any device intended to protect automatically against abnormal conditions only by preventing improper manipulation.

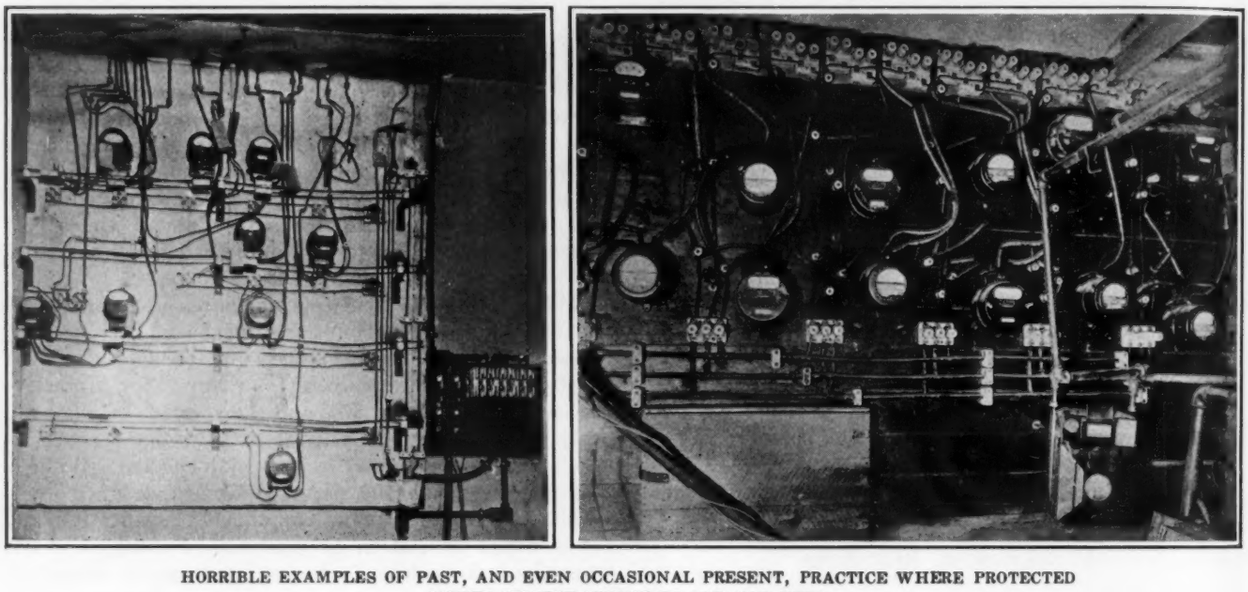
"Rarely do people monkey with the safety valve on a boiler or overload it with weights, yet it is an everyday occurrence for them to tamper with the safety valve of the electrical installation—the fuse," declares a prominent authority on electrical inspection. Experience has amply verified this contention and demonstrated the hazards involved in such abuse. To chance the possibility of decreased efficacy or entire elimination of the safety device, when its operation indicates the existence of the abnormal conditions which it is primarily intended to protect against, is surely contrary to any concept of insuring safety at all times. If proper safeguarding is not assured when most needed, why not eliminate it altogether and resort to boilers capable of resisting limitless pressures and conductors and apparatus of enormous conductivity?

Aside from operating policy and considerations of practice, a fuse, circuit breaker or any other protective device against abnormal conditions must be continuously foolproof to be entirely safe. This result is excellently accomplished by locked inclosure. While a seal may not give 100 per cent assurance of inaccessibility, at least it is a "hands off" notification and not a direct invitation to wrongdoing such as exists when the main-service fuses are intentionally accessible.

Concede that sealed main-service fuses impose certain policies of fuse maintenance on the utility. Also grant that the right of the utility to seal the service box bought and installed by the consumer has been disputed. Messrs. Fryer and Gregory in their recent article say that "the public service commission supports this contention and says a customer may open his meter-service box and renew his main-line fuse if he then informs the utility—but does he inform the utility?" What the customer does through ignorance of, indifference to, or intent contrary to, legalized requirement cannot be maintained as a logical reason to disprove the soundness of such requirement. Public service commissions have not only repeatedly ruled that to insure safe maintenance of the service supply the utility has the right to seal its main service fuses in the customer's box (for a recent instance see ELECTRICAL WORLD, July 19, 1924, "Commission Rulings"), but several state commissions, fire marshals and municipal bureaus (note Michigan and others) have adopted regulations mandatorily requiring inclosed externally operated meter-service switches with sealed main-service fuses.

Local conditions, such as customer distribution over area served, limitations of service maintenance expenditure, etc., may affect conclusions in adopting policies. Consequently it is fair to assume that those utilities that seal main-service fuses do so because they as well as the consumer derive safety benefits and because it is good business to permit this consideration to dominate. Those who do not seal them reach their decision, not without a full realization of the superior safety of sealed fuses, but because their practice must be governed by other considerations.

There is little foundation to the claim that the circuit breaker (in which derangement or deterioration usually decreases efficacy and which may not stand up under the severity of meter-service installation conditions) provides greater assurance of unalterable excess-current protective functioning than a simple, inert fuse element, concerning which it has been urged that "deterioration of its parts almost invariably results in its opening the circuit below its rating." While "opportunity is afforded the consumer to restore his service without opening the box" (in the case of the circuit breaker), the seal is still an obstacle to "opening the box" when defective functioning or a desire of changing the calibration of a circuit breaker or rendering it inoperative prompts such action.



HORRIBLE EXAMPLES OF PAST, AND EVEN OCCASIONAL PRESENT, PRACTICE WHERE PROTECTED METER-SERVICE SWITCHES ARE NOT USED

Until some practically acceptable means for insuring proper fuse renewal is available, it would appear, as an independent consideration, that excess current protection by main fuses is best secured by following the recommendation: "Put the main fuses under seal."

SERVICE ESSENTIALS

On nearly 90 per cent of the service installations in this country a good approved 30-amp. externally operated inclosed switch will satisfactorily serve for controlling load. Departure (as in accessible fuse switches) from the simple combination of a fused switch block completely inclosed in a sealable cabinet usually introduces interlocking parts whose correct coaction is vital.

Accessible fuse switches may not provide unalterable excess-current protection, but they embody, in common with other types of fused switches, a combination of manual and automatic circuit-controlling elements of proved dependence for such service. A fused switch is simple, rugged, reliable and inexpensive as compared with a relatively complicated, delicate, easily disarranged and (at present) costly circuit breaker. A fuse serves by being destroyed and each replacement reestablishes the circuit continuity with new parts. So far no equally simple, rugged, inexpensive substitute, fairly dependable even under extreme abuse, has been offered.

Assured unalterable excess-current protective performance of a circuit breaker can hardly be guaranteed in the face of inherent shortcomings. There is no evidence that any circuit-breaker device, of permissible type and construction, satisfies the severe repetitive circuit-rupturing and endurance requirements or will properly perform after long periods of inaction without entailing substantial attention and expense for maintenance.

Efficacious service-load control concerns all interests, but the utility has further considerations. To it the service switch represents a counter and the meter a cash register. Unmetered or improperly recorded energy is a loss. Protection against tampering and use of unmetered current, and also meter-testing facilities, are therefore regarded as essentials of a complete meter-service switch unit.

The protective combination of the meter, the switch, the excess-current protection and the meter-testing parts should improve unpractical or uneconomic procedure or methods on either side. Overhead-distribution service practice requires the consumer's contractor to terminate the load circuit in a main service switch and also to extend service wires to the outside of the building. The utility connects these and installs its meter. There are many considerations of utility policy which, unless radically altered, will practically prohibit any change in such procedure.

Effective protection against tampering and against the use of unmetered energy necessitates prevention of access to conductors and connecting parts on the service or line side of the meter. This is provided in most meter-service switches by the switch and fuse inclosing cabinet. Removable "end walls," provided with openings to fit the terminal chamber of different meters, are interchangeably usable in standardized cabinets of over a half dozen producers and are exceedingly simple, rugged and inexpensive parts of the complete unit. Two or three manufacturers, however, use end walls fitted to their own boxes only and appear to the writer to offer no economic or other advantage not equally well obtained with some form of standardized end wall. And standardization does help the utility.

The variety of end walls which the utility must carry to provide for different meters has been offered as an

objection to the method recommended above. As current practice usually resolves itself down to the purchasing and use over extended periods of one make of meter, the utility need only carry one style of single-piece end walls to care for new meter installation. Some effort has been made to bring about uniformity in size and contour of meter terminal chambers. Such meter standardization will permit the universal use of a simple knock-out type of end wall and provide complete protective corelationship. With co-operation of all interests this further simplification in end-wall standardization is easily possible.

In connection with their suggestion of a circuit-breaker box, Messrs. Fryer and Gregory have proposed complete inclosure of the meter with the switch—and it may be that ultimately such a practice will be found desirable. With the meter and the meter service switch as separately inclosed entities, the chance of injury to the meter mechanism due to circuit-opening manifestations is practically eliminated, while with a common housing the possibility of such damage cannot be ignored. As the meter cover is to be dispensed with in the unit proposed by Messrs Fryer and Gregory, it is questionable whether meter manufacturers or utility companies will care to have their meters so exposed.

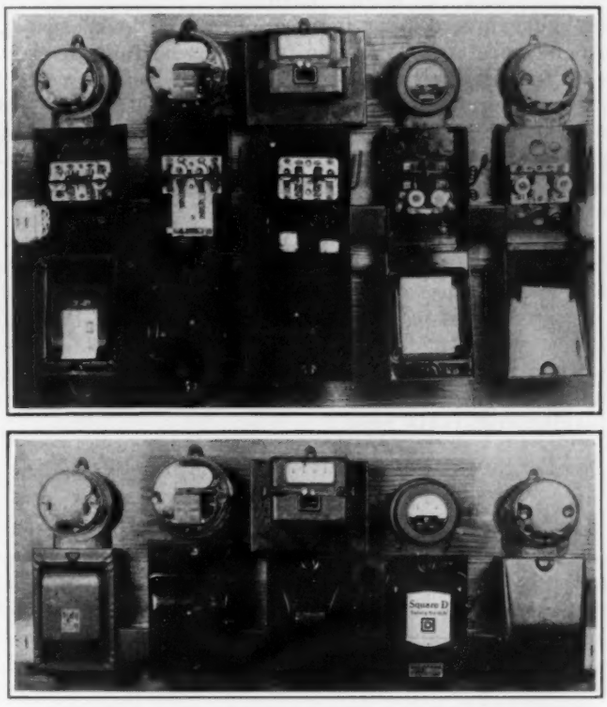
But, irrespective of which end wall is best and whether it serves better than a complete inclosure of the meter with the switch, etc., protection against tampering and use of unmetered energy depends not on how much of the meter is covered up, but rather upon the security of the sealing means. Here we find the weak link in the tamper-proof chain. So long as meter beaters laugh at seals, it is inconceivable how any meter-service switch, using either fuse or circuit breaker, but dependent upon a seal for security against access, can prove its superiority in this particular over any other.

It is to be noted in switches with accessible fuses that these are the main fuses connected on the service side, or ahead of the meter. This introduces an additional weakness, as access to any part which is connected or connectable to the supply side of the meter obviously offers opportunity for unmetered current tapping. Even with the cover over the accessible fuses fitted as closely as imposed economic manufacturing conditions will permit, experience proves that a thin insulated conductor can be inserted in such spaces as usually exist between the coacting fuse-inclosing parts.

On three-wire services, with inside connected potential coil meter, removal or blowing of the main service side fuse in either outside leg "kills" the meter, but unmetered energy is nevertheless supplied through the neutral and the other outside leg. The ease of practicing this method of beating the meter by mere disconnection of a single invitingly accessible fuse is obvious.

Blowing and abuse of main fuses may be largely reduced by providing accessible load-side, in addition to sealed, service-side, main fuses. The load-side fuses are sized for normal supply limitations, while the service-side fusing is to the maximum capacity of the switch. Advantageous use of this principle is exemplified in one unit combining service switch and distribution functioning with main service-side conected fuses sealed within the inclosing cabinet, while load-side connected branch fuses are accessible at all times. Experience indicates less seal breaking with such double-fused switches than with devices which do not combine load-side and service-side fusing.

Meter-testing facilities may be variously embodied, but basically some means for readily opening the circuit on the load side of the meter (for certain services, also on the service side) is essential. Connecting parts and contacts added to those needed for manual and automatic load controlling being obviously undesirable, a much-used arrangement connects the main fuse on the service side and the switch on the load side of



A COMPOSITE BANKED ARRANGEMENT OF FIVE STANDARDIZED METER-SERVICE SWITCHES, EACH OF DIFFERENT MANUFACTURE, SHOWING BOTH OPEN AND CLOSED VIEWS

the meter. In this arrangement the load-controlling switch serves also for meter testing. Where switch and fuse are connected ahead of the meter it is necessary to provide meter-testing means. However, in many combination service and branch distribution units in which the switch and main fuses are connected ahead of the meter the necessity of separate testing parts is eliminated, because the load-side fuses serve for excess-current branch-circuit protection and, by removal, free the load-side connections of the meter for testing purposes.

The incorporation of testing facilities in a meter-service switch affects, at least to some extent, its merit. Such facilities should provide for bypassing the meter, permit connections for any desired test, be manipulable without hazard to the tester or from crossing wires, and, for economic reasons, should preferably be mounted on the same base with the service-load-controlling parts.

In switches above 30 amp., there are indications of a trend to have the fuse controlled by the switch and to connect both ahead of the meter. While possessing some claim to safety in fuse manipulation, such a switch-fuse-meter arrangement requires additional testing parts.

It has been pointed out by Mr. Palmer (ELECTRICAL WORLD, June 14, 1924, page 1225) that a significant difference between an "AA" switch and an "A" switch

(Underwriters' Laboratories' Classification), when both of them embody accessibility of main fuses when dead and prevention of access to live parts, lies in reversibility of connection to the supply and load wires in the former, whereas in the latter it is necessary to connect the supply or line wires to the switch terminals and the load wires to the fuse terminals. So far as meter-service-switch functioning is concerned, this difference appears to the writer to be unimportant. In such "A" switches, clearly visible marking practically eliminates the possibility of error. Connection reversibility does not guarantee correct installation of an "AA" switch. An incompetent or careless installer who fails to properly connect the line and load wires to their respective clearly indicated terminals in an "A" switch will just as likely connect two line wires to switch and fuse parts in the same leg of an "AA" switch. Also connection reversibility entails parts unnecessary in the other type.

The important differentiation in fused meter-service switches exists in the accessibility or inaccessibility of the main fuses and not in peculiar construction or arrangement of parts to permit reversibility of line and load. As yet it does not appear, from a consideration of their functioning for service essentials, that switches with accessible main fuses will prevail as the dominantly preferable type.

ECONOMIC CONSIDERATIONS OF METER-SERVICE SWITCH PRACTICE

When meter-service switches were first submitted to central-station managers they questioned whether the benefits derived warranted the investment. So long as the use of protected meter-service switches depended upon purchase and installation by the utility, progress was slow. Neither the utility's nor the consumer's interest could be dominantly asserted in any such device. Through extreme simplification, good but inexpensive construction, and double functioning of the protection against tampering and the circuit-controlling element, a meter-service switch serving the needs of both interests, and marketable at a price that compared favorably with that of an ordinary externally operated inclosed switch of equally good construction, was evolved. It would appear that the needs of the meter-service switch were reasonably well satisfied with this development as rapid and extensive use followed. Production of such switches of uniform size and general design by various manufacturers, marketing through regular merchandising channels, permitted utilities to adopt and specify standardized meter-service switches to be installed by the consumer's contractor. The benefits derived well warranted furnishing of end walls or meter trims by the utility. Such "results attained after persistent efforts" should not be slurred because of the efforts expended to attain them.

In their article Messrs. Fryer and Gregory suppose that a consumer "pays $5 for a meter service box and the utility $8 for the meter." The best standardized 30-amp. sealed-fuse type of meter-service switch, serving for load controlling, meter testing and protection purposes (without branch distribution), sells to the consumer's contractor at about half of this figure. Other switches somewhat similar in character are priced at substantially below $2. It is not reasonable to assume that circuit-breaker devices giving equally good service can be produced and marketed competitively.

It would seem more conservative to defer estimates of production costs and selling prices until they can be based on actual manufacturing experience. How can any substantial amount be deducted from $8 for the meter by placing it in a common inclosure with the load-controlling device and merely eliminating the meter cover now used? Under the most favorable possibilities, the combined unit will necessitate as much greater expenditure by the utility as the difference between the cost of an ordinary meter and the cost of the combined unit.

Messrs. Fryer and Gregory offer the argument that the advantages of a combined unit "offer to the central station incentives for utility ownership of meter service apparatus." But this argument can hardly be maintained in view of the opposite trend in utility policy. And the statement that "this should be pleasing to the consumer because his investment will be less" is not based on good economic reasoning. If the consumer's investment is less, then the utility's is more, and since the utility is not entirely guided by philanthropic motives, the consumer is apt to find the additional cost, even though perhaps hardly visible, reflected in the rate.

Many utilities have discarded the practice of owning the service switch, and it will require weighty counterbalancing economic benefits to induce them again to assume ownership and installation of the complete service. Other utilities whose service investment has always been limited to the meter will probably not be easily swayed to make a substantial increase of service costs. Installation by the contractor of a combination meter and control unit is practically eliminated.

Mr. Palmer does not discuss meter-service economies in his article. But it should be pointed out that accessible main-fuse switches are more expensive than the meter-service switch with sealed main fuses as now developed (without branch distribution). As price differences frequently affect ultimate purchasing conclusions, the benefits derived will have to warrant increased expenditure by utility or consumer.

ARE PATENTS A HANDICAP?

I think a word about patents is desirable. For there may be others than Messrs. Fryer and Gregory who believe that "this situation is further aggravated in the minds of some by a belief that the patent situation is largely responsible for concerted action on the part of some manufacturers to force the adoption of their product," and "this belief is a great handicap to these manufacturers." Quite naturally, there have been errors in engineering, production and merchandising. That those who have directed their best energies to solve this problem should patent the product of ingenuity, skill and money investment surely cannot be regarded as a blot on their escutcheon. Should these aggressive workers be boycotted because they "put it across"? Have those who submit other meter-service units adopted a non-patenting policy and will they dedicate their work to the people at large, or are they proceeding along the same lines followed by others and patenting their inventive work for profit —not glory? Irrespective of patents, only demonstrated superiority survives.

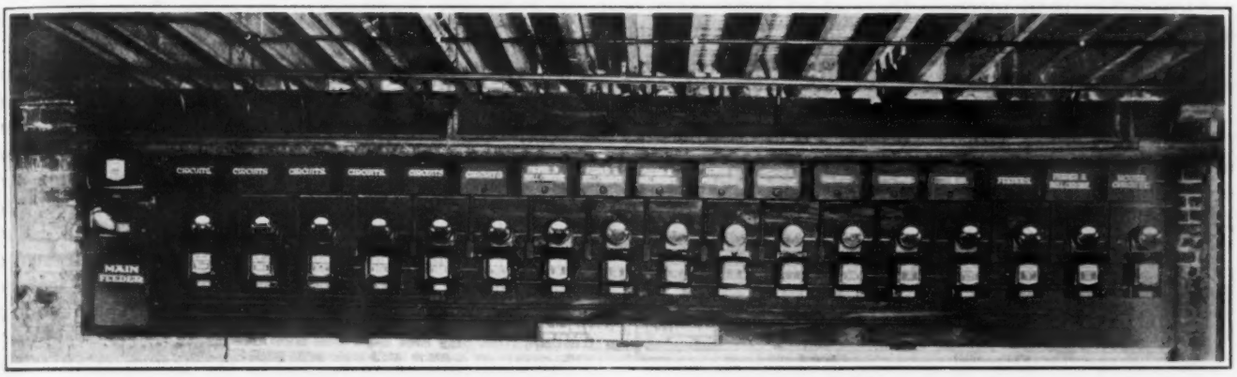
Furthermore, has this been a "great handicap to these manufacturers"? The fact is that with about two million or more fused meter-service devices already in use the actual output to meet current demand reaches around three-quarters of a million a year. Surely this fact does not confirm the claim that "the safety-box

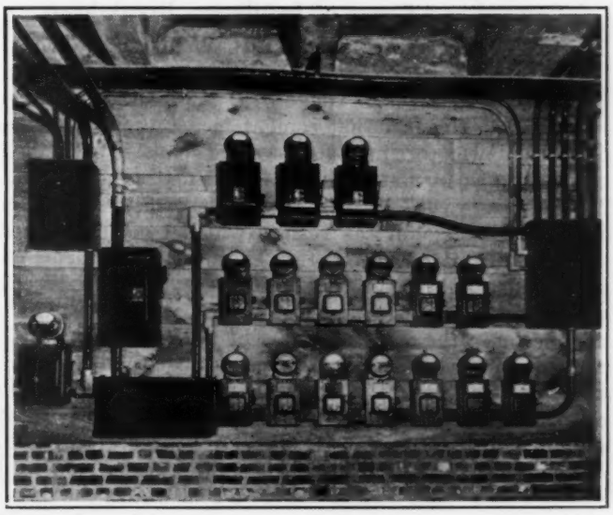
proposal was not enthusiastically received by the central-station industry."

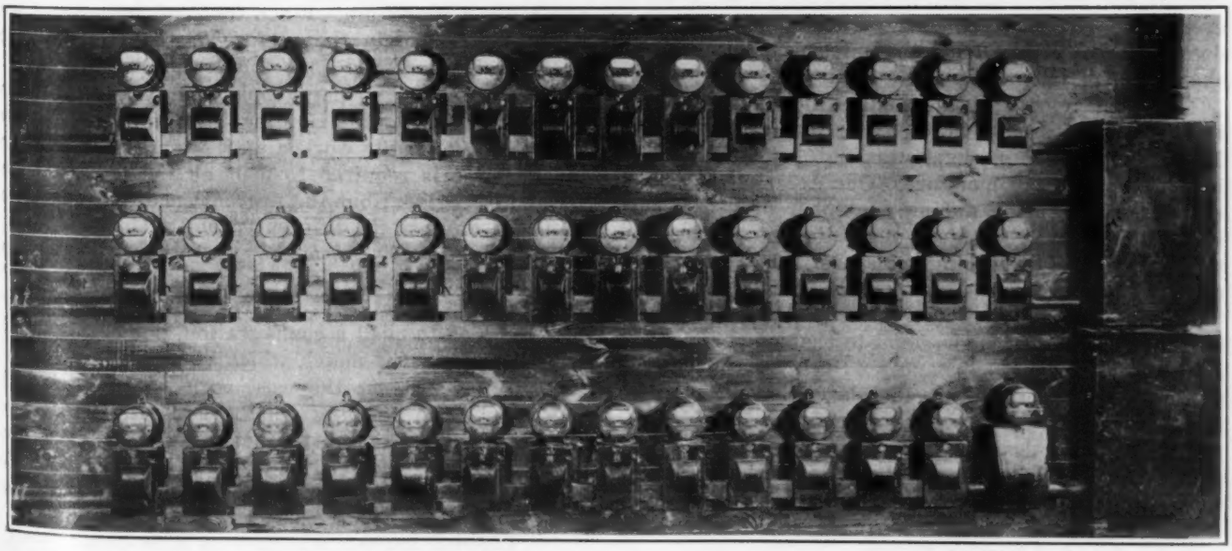
As I have said before there is no intention to deny the possibility of a completely functioning, practical and inexpensive circuit-breaker meter-service switch ultimately solving the meter-service problem, but, as admitted by its advocates, "It is not assumed that any suggested change will be made today or tomorrow." Therefore, it is neither constructive nor good policy to scuttle the good ship "Standardized Meter Service Switch" until we have another of proved worthiness at least equal.

In his article Mr. Palmer disagrees with the prophecy that a circuit breaker will ultimately solve the meter-service problem. He argues for a switch involving main-service fuses for excess-current protection. Incidentally he argues, as has been stated above, for accessibility of main fuses to the consumer.

More than twenty-five years ago a heated discussion on circuit breakers versus fuses occupied much space in the ELECTRICAL WORLD, and I am unable to find any basically new points now presented for or against either side which were not offered then. Miniature breakers, considered practically impossible some years ago, are







EXAMPLES OF MODERN PRACTICE WITH STANDARDIZED METER-SERVICE SWITCHES FROM VARIOUS PARTS OF THE COUNTRY

now obtainable; but for the purpose under consideration they still involve as basic elements, (a) a circuit opening and closing element, (b) an automatic releasing element operable by excess-current thermal or magnetic manifestations (or both), and (c) a manually operable actuating element arranged to prevent closing the circuit against automatic releasing. While these elements are now combined with surprising ingenuity and compactness and at lower cost, they only replace the circuit opening and closing element and the fuse element of the fused switch. Current prices, the duality of interests involved, methods of handling and the trend to reduce rather than increase the cost of meter service appear to be serious obstacles to such circuit-breaker units. Also, elimination of any shortcomings which may exist in present standardized meter-service switches will increase the difficulty of making a substitute.

With Mr. Palmer, "I hold no brief for either the fuse or the circuit breaker," nor for any form, arrangement or combination of either. My endeavor has been to present both sides of the story.

Letters from Our Readers

Cement as a Cause of Insulation Breakdown

To the Editors of the ELECTRICAL WORLD:

In his reply to my article in the March 22 issue of the ELECTRICAL WORLD (page 575) A. O. Austin makes reference to the fact that cement is not the only cause of breakdowns of insulators, other causes producing cracks of the insulators too. (See ELECTRICAL WORLD, May 17, page 1007.) This assertion, of course, cannot be contradicted, but the results which I communicated were based on the assumption that the constitution of the porcelain is such that the latter does not break down under the influence of the heat variations which may occur in the atmosphere. The new porcelain which we use now has such a resistance against sudden differences of temperature that cracks owing to atmospheric changes of temperature are impossible. We always test a number of insulators from every manufactured batch, and we guarantee that every insulator can be immersed ninety times from boiling water to cold water, the duration of the immersion being a quarter of an hour in every case. If porcelain can withstand such tests, it does not break either under the influence of atmospheric changes or of temperature.

The most important fact, one which I dwelt upon briefly in my article in the ELECTRICAL WORLD last March, and which perhaps was not sufficiently clear, is the absorption of moisture. Our experiments, which have been carried on during a number of years, have shown that after about four years the cement acquires the property of absorbing moisture, this resulting in an increase of volume. This increase may cause cracks of the porcelain, even if the coefficient of expansion of the binder has been made equal to that of porcelain by addition of suitable substances. Such a result can be avoided only by preventing the absorption of moisture, and the binder is made impervious to water in the manner which I described.

We have published in a detailed way the results of these investigations, and we can submit these on application to all interested. DR. E. ROSENTHAL.

A. E. G.—Rosenthal Porcelain Factory, Berlin-Hennigsdorf, Germany.

"Don't Try to Melt Ice"

To the Editors of the ELECTRICAL WORLD:

In your November 1 issue, on page 962, the last speaker at the ice meeting of the A. S. C. E. Detroit convention—a hydraulic engineer—is reported as saying that "it would take 7,000,000 hp. in steam to melt two feet of ice in a 48-mile stretch of the river." May I point out to the readers of the ELECTRICAL WORLD that the figures just quoted have no bearing whatever on the facts which it was my privilege to present to the A. S. C. E.?

The melting of ice and the warming of water are, of course, only accomplished by the expenditures of enormous quantities of energy, in the form of heat, when man attempts to do such things with heat supplied from extraneous sources. With the aid of diagrams I tried to show at Detroit that the heat from 21,000,000 hp. would have been needed to melt ice at a very small power plant if the water which passed through that plant had to be turned from the solid to the liquid state. But I also showed that a 30-hp. boiler had been successfully used for many years to prevent a small portion of the water from turning into ice and adhering to the vulnerable parts of the plant under discussion.

My contribution in regard to the ice question at the Detroit meeting was prefaced by two important statements, namely, (a) that "when a problem is understood its solution is usually close at hand," and (b) that the ice problem at hydraulic power plants is full of quantitative values which must be fully appreciated before any engineer could have the heart to tackle that problem.

At the Keokuk Dam the most minutely conceivable upward movement of water from beneath the surface is quite sufficient to prevent ice from forming upon and near the gates in the dam. That knowledge is now also put to good use at other places, and ice is prevented from being formed simply by turning up onto the surface new water which has not given up its latent heat.

On the Rock River at Dixon, Ill., during five successive winters a film of waste condensing water at a temperature of 62 deg. F. was discharged on the surface of the stream and an open channel 100 ft. wide (upon which no ice grew) was maintained for nearly two miles downstream. When the condenser water was not discharged onto the surface of that river the ice grew again, as it had done for years before.

The two preceding paragraphs contain statements of simple facts. Figures running into millions of horsepower can be readily worked up if we wish to know how much power is required to melt all the ice in a small stretch of a river; but the prevention of the formation of ice is an entirely different problem, involving, as I tried to show at Detroit, quantitative values of an entirely different character from those concerned with ice melting. The best efforts of a fire brigade are often needed to quell a conflagration, but a baby might have blown out the match which started it.

Some day I trust the ease with which ice can be prevented from forming will be generally understood. "It is only by the constant reiteration of facts that the public is educated," and that is my reason for asking the ELECTRICAL WORLD to publish this communication. JOHN MURPHY,

Electrical Engineer Department of Railways and Canals. Ottawa, Canada.

Central Station and Industrial Practice

Safety for Electric Mine Hoist Equipment

ELECTRICALLY operated hoists have many advantages from an economical and operating viewpoint over the other kinds of hoists, declared J. P. Johnson, mechanical engineer with the United Verde Copper Company, Clarksdale, Ariz., before the American Safety Council meeting at Louisville on October 1. It is true that there still exists some prejudice against electric hoists on the grounds of safety, but the development of safety devices which have proved absolutely reliable in years of service will soon overcome this prejudice. By means of systems of wiring and safety devices protection can be had against overwinding, overspeed, low voltage, overload and failure of power. Protection against overwinding can best be effected by limit switches placed on the shaft itself. Overspeed can be prevented by a mechanical centrifugal governor geared to the hoist, the governor tripping the safety switch at any predetermined speed. Low-voltage and overload devices operate in the usual manner through relays and trip coils to trip the main circuit breaker and disconnect the motor from the line. Power failure also operates through similar circuit breakers.

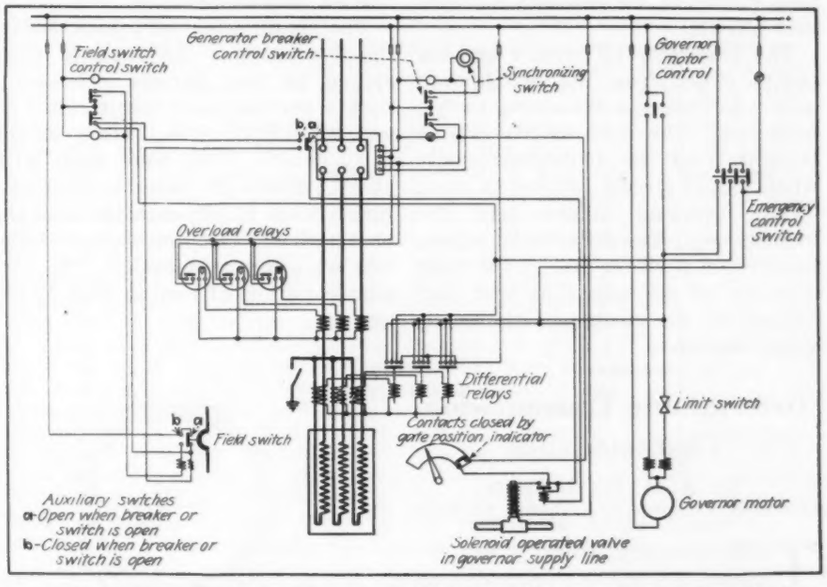
In hoisting operations it is not only necessary to disconnect the motor from the line but just as important to set the brake positively. This is usually accomplished by another set of relays and a magnetic trip which, simultaneously with the opening of the main circuit breaker, sets the brake by tripping the gravity weight. All safety switches and devices which operate to stop the hoists are connected in series to a separate low-voltage relay circuit, and the disruption of this circuit at any point will automatically stop the hoist. This system provides protection even against the carelessness of a hoist engineer.

Continuous overloads on underground lines should never be permitted. Peak loads due to hoisting will throw dangerous surges into the power lines if the proper precautions are not taken in the control of a hoist motor. Unless conditions permit of a good counterbalance between cages, it is not feasible to connect the hoist motor direct to the line. The peak of acceleration under most conditions is too great compared with the running load to allow for efficient operation of the system. It is considered the best practice today, on account of the better control, to drive hoists with direct-current motors operated from motor-generator sets with or without flywheel sets to equalize the peaks, depending on whether or not there be sufficient surplus capacity in the power line or in the power station.

The control of direct-current motors presents no difficulties to the engineer. In lowering heavy loads regenerative resistance in the motor is obtained at any speed so that the brake need not be employed. In the case of alternating-current induction hoist motors full regenerative control is not possible except when lowering considerably faster than the rated hoisting speed in order that the motor may run above synchronous speed. When lowering at lower speeds, it is necessary to plug the motor, a method which is not only wasteful of electrical energy but not so safe as desirable. In any system of hoisting the safe control of the hoist motor is a matter of prime importance. Smooth acceleration and deceleration are the prime factors.

Emergency Control for Generating Stations

AT THE Mount Holly hydroelectric plant of the Southern Power Company there is an arrangement on the switchboard whereby an operator by pulling a single lever can cut each unit completely out of service in case of trouble. This lever opens all breakers, fields, etc, and is quite unusual. The closing emergency switch, as it is termed by the Southern Power Company, is a three-pole switch which, when closed, will remain closed until reset by hand. A red signal lamp is provided to indicate the closed position.



ARRANGEMENT FOR CUTTING OUT GENERATING UNIT BY A SINGLE OPERATION

Upon closing the emergency switch the governor motor is started and the turbine gates begin to close. This motor continues to run irrespective of the other operations until the gates are entirely closed, and it is cleared, finally, by the limit switch. Simultaneously with the starting of this motor, the emergency switch closes a solenoid-operated valve in the governor supply line.

When the turbine gates are closed to a predetermined position, contacts

at the gate position indicator close, completing the tripping circuit of the generator oil circuit breaker.

The opening of the generator oil circuit breaker opens the auxiliary switch, *a*, taking current off the solenoid-operated valve in the governor supply line, and closes an auxiliary switch, *b*, which completes the tripping circuit of the solenoid-operated field switch.

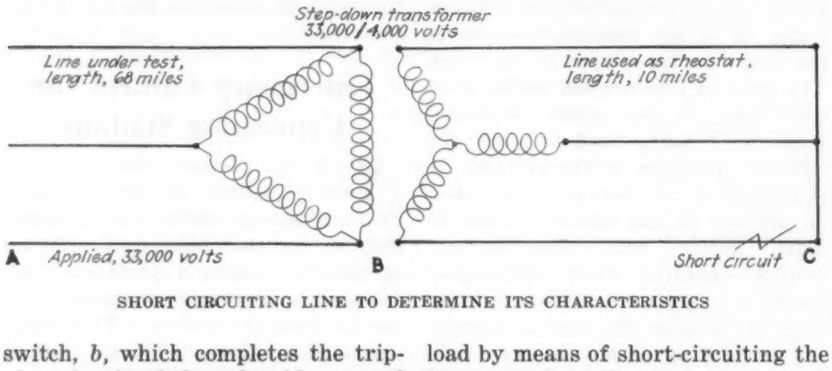
The generator oil circuit breaker can be closed from the switchboard only when the synchronizing switch is closed. The field switch can be tripped from the switchboard only when the oil circuit breaker is open.

The overload relays trip the breaker only. The differential relays, hand-reset, perform exactly the same sequence of operations as that performed by the closing of the emergency switch.

Determining Transmission Characteristics

BY A. N. RICHARDSON
Operating Superintendent Illinois Northern Utilities Company, Dixon, Ill.

THIS company recently had occasion to test the electrical characteristics of a long 33,000-volt line. Since the line had so many various sizes of wire and cross-arm configurations, it was difficult to calculate all the line constants. Instead, some easy way of testing the line was desired. This was finally done by placing step-down transformers in a portion of the line and short-circuiting it, as illustrated herewith. To furnish this load a bank of 33,000/4,000-volt transformers was connected at the receiving end. The high-voltage side was connected to the line under test, and the low-voltage side was connected to a second transmission line which could be spared for use. This second line served as a medium of varying the load by means of short-circuiting the line at various distances.



SHORT CIRCUITING LINE TO DETERMINE ITS CHARACTERISTICS

The arrangement of conductors on the line used as the rheostat were spaced on two two-pin cross-arms with a vertical riser spacing of 3 ft. and with 3 ft. 4 in. across to the third phase. Tests were made with short circuits at rising various distances from *B*. In each instance the observed and calculated characteristics were almost identical. So this simple method of testing gave all the line characteristics desired. With a distance from *B* to *C* of 10 miles, the results given in the accompanying table were obtained.

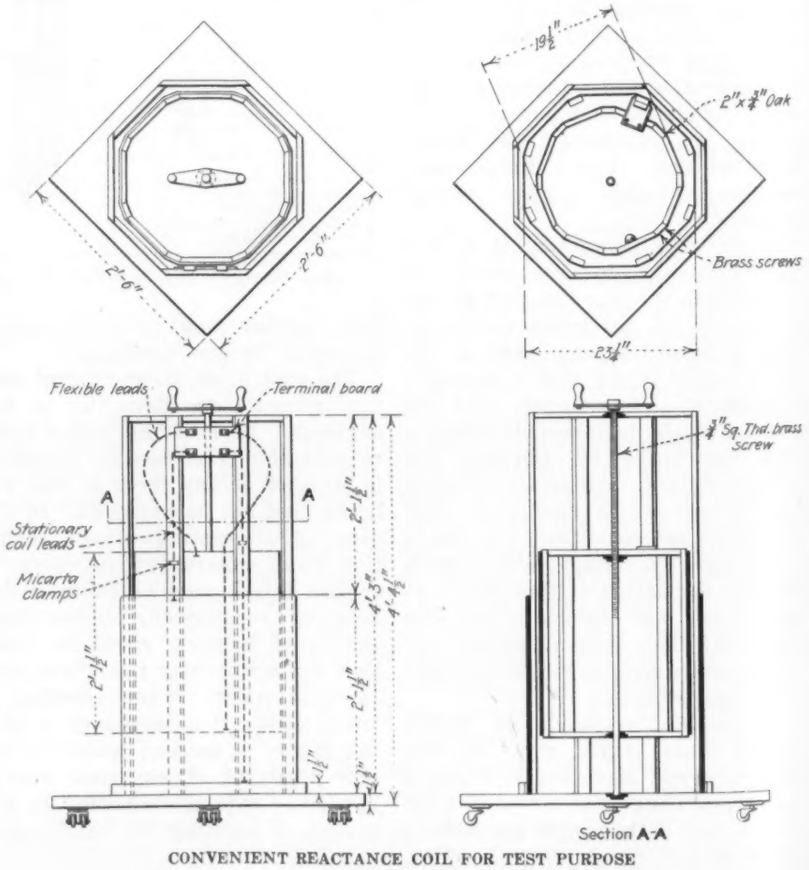
TEST RESULTS ON 33,000-VOLT LINE

Line AB	
Distance, miles	68
Volts applied at A	33,000
Volts received at B	28,500
Line BC	
Conductors	No. 1 copper
Volts applied at B	2,030
Amperes in each wire	245
Observed kva. at B	1,500
Observed power factor	0.67
Calculated resistance, B-C, ohms	6.6
Calculated reactance, B-C, ohms	7.0
Calculated impedance, ohms	9.6
Calculated amperes	234
Calculated power factor	0.68

Inductance Coil for Test Work

BY J. T. WALTHER
Professor of Electrical Engineering
Municipal University of Akron, Ohio

A VARIABLE air-core inductance coil for testing and laboratory work has been built at the Municipal University of Akron and has been found to be very useful and convenient to operate. The reactor, shown in the accompanying illustration, has an inductance of 0.037 henry in the maximum series position and 0.004 henry in the minimum buck position. The resistance of the stationary coil is 0.735 ohm, while the moving coil is 0.591 ohm, both measured at 75 deg. F. On the moving coil there are 165 turns of No. 8 enameled, single-cotton-covered, solid-copper wire wound on 30-mil Fuller board. The stationary coil has 175 turns of the same kind of wire protected by 2-in. friction tape half lapped. Handle, bearings and guides, with necessary screws, bolts, pins, etc., are constructed entirely of brass.



CONVENIENT REACTANCE COIL FOR TEST PURPOSE

Repairing and Testing Transformers

THE service engineer should be responsible for the proper repairing and testing of all transformers, according to instructions prepared by the Worcester (Mass.) Electric Light Company to cover this type of equipment. High-voltage tests should be made under the direction and supervision of the meter engineer upon request of the service engineer. The detailed instructions covering the repairing and testing of transformers are given below:

All used transformers returned to stock shall be repaired, tested and made "ready for service" as soon as possible after they are received. All transformers in service, all subway-type transformers ready for service and all those of the overhead type up to and including 50-kva. capacity that are ready for service shall be kept filled to the proper level with transil oil. Overhead-type transformers above 50 kva. shall have sufficient oil kept in them to cover the windings only, and the remainder necessary to reach the proper level shall be put in by the crew setting them after they are in position. The necessary oil for this purpose shall be furnished to the crew by a transformer repair man. In general No. 10 transil oil shall be used. The transformer repair man shall be responsible to the service engineer for the condition and quality of the oil in every transformer which he passes as "ready for service."

When a used transformer is returned, the transformer repair man shall drain off all the oil and refill with the proper amount of filtered oil. The old oil shall be stored in the place provided until it can be properly filtered. Unless the transformer repair man has reason to believe that the insulation is broken down, he shall carefully examine all bushings, terminals, leads and insulating compounds and renew as many of those parts as necesssary, and also make certain that the covered gasket is intact. If it is of the subway type and the leads are less than 4 ft. long, or appear to be unfit for further use, he shall set it aside and inform the service engineer. Otherwise he shall place the transformer under the high-voltage test room, in a position suitable to make the electrical tests, and inform the meter engineer that he is ready to test transformers. No transformer shall be tested that does not contain sufficient transil oil at least to cover the windings.

The meter engineer shall assign a test man, who shall make the test, with the assistance of the transformer repair man, as follows:

The test man shall be responsible for the application of the proper voltages, which shall be in accordance with the A. I. E. E. standards as recorded in section 6261, and are as follows: For all distribution transformers having normal primary voltages between 550 volts and 4,500 volts inclusive, apply 10,000 volts between the primary windings and combined secondary windings and core, and twice normal secondary voltage plus 1,000 volts between the secondary windings and core.

For all other transformers the test voltage shall be twice the normal operating voltage of the coil under test, plus 1,000 volts between the windings on the test and all other windings and the core. All windings not on the test shall in all cases be short-circuited and connected to the core. Interconnected polyphase windings shall be tested as one unit.

Transformers having taps shall have the taps connected so that the voltage ratio agrees with the following schedule:

Primary Volts	Secondary Volts
2,200	110-220
2,200	575
4,400	110-220
4,400	575

When making the test, the test man shall, before closing the primary switch, make certain that the transformer repair man is on guard to prevent any person approaching the high voltage, and that the transformer repair man is himself at a safe distance from the apparatus and has been duly notified by means of the audible signal provided that the switch is about to be closed. The test man shall then close the switch and gradually increase the voltage from zero to the proper value, hold it there for one minute, then open the switch. The red signal lamps will also remain lighted while the switch is closed.

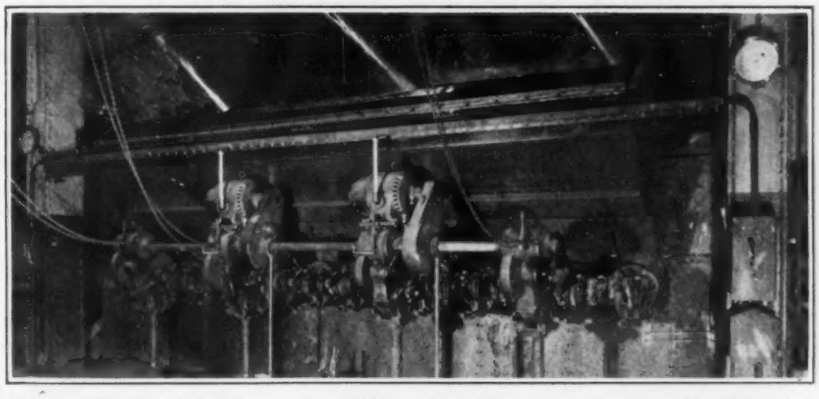
Should a transformer break down under test, it shall be tagged "Insulation breakdown" and disposed of as ordered by the service engineer.

New subway transformers, and old ones which require new leads, shall be fitted with leads by a jointer. Such leads shall consist of the proper kind of lead-covered cable and shall be approximately 8 ft. long. The general line foreman shall, upon request of the service engineer, assign a jointer for this work and cause the necessary cable order to be issued. He shall see to it that only short lengths of cable saved for this purpose are used when such lengths are available. The jointer shall install the leads in the following manner: The lead sheath shall be removed for a sufficient distance to permit the cable to reach the terminals of the transformer, the brass sleeve from the union on the transformer case fitted to the cable sheath and a wiped joint made between the cable and the union. The space between the inner wall of the union sleeve and the cable shall be filled with insulating compound, the terminal soldered to the conductor and made fast to the transformer winding. The electrical tests shall then be made as previously described, sufficient lead and insulation having been removed by the jointer from the ends of the leads for this purpose.

After the electrical tests have been made, the ends of the leads shall be sealed with solder by the jointer. The cover shall then be fastened down and the transformer tested for leaks by the transformer repair man as follows: A piece of the special packing provided for this purpose, and of the proper size, shall be covered with linseed oil and used as a gasket between the cover and the case. After the cover is securely bolted down on this gasket, the plug in the cover shall be removed and a bushing substituted which is fitted with a pressure gage and a suitable connection for a tire pump. Air shall be forced into the transformer until a pressure of approximately 10 lb. per square inch is indicated by the gage. The terminal joints shall now be covered with a solution of soap in water in order that any leaks may be detected by the formation of bubbles. The transformer shall not be passed until all leaks have been eliminated and the pressure has remained constant for at least five minutes.

If the insulation and voltage ratio pass the test and if, in a subway transformer, all leaks have been stopped, the transformer man shall mark the tag "Ready for service."

Motor Drive that Permits Wide Range of Stoker Speed



IN LAST week's issue, on page 1007, the various practices of applying motor drives to stokers were discussed, with particular reference to an installation in the Millers Ford station of the Dayton Power & Light Company. Here each motor is mounted on a two-speed gear box immediately below the coal hopper. Since publishing this article the above illustration has become available. It is to be noted that Ward-Leonard control has been adopted. The rheostat for each motor is placed in a metal box on the structural steel column between adjacent boilers. A silent chain drive is used.

Lowering Unbalances of Neutral Reactors

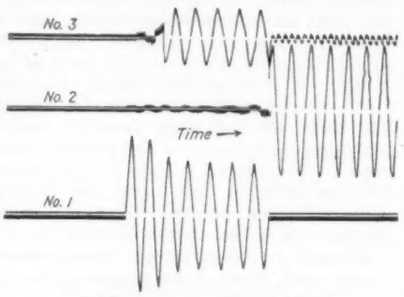
BY H. WYLIE SMITH
Testing Department, Commonwealth Edison Company, Chicago

THE practice of connecting a current-limiting reactor in the neutral of the 2,300-volt side of substation transformers was adopted some years ago by the Commonwealth Edison Company. The function of this reactor is similar to the function of the neutral resistances commonly used in generator neutrals. That is, the reactor limits the current on feeder short circuits to ground to a value that can be safely handled by the feeder oil breakers. At the same time it prevents undue potential rises above ground.

A difficulty was encountered, however, in the voltage unbalance caused by even moderate unbalance in load. Unlike the generating station load, the 2,300-volt substation load cannot always be exactly balanced. Such unbalance as exists results in a neutral current through the neutral reactor with consequent drop across the reactor and unbalancing of the phase voltages. This unbalancing is cumulative since the motor load on the low-voltage phase tends to draw more current on this phase with consequent further unbalancing of load and voltage. At one substation a 19 per cent unbalance in current was augmented to a 44 per cent unbalance by the neutral reactor. The voltage unbalance, which was only about 1 per cent with the reactor short-circuited, was augmented by the reactor to 16 per cent.

A solution to this difficulty has recently been devised which retains the protection of the reactor and at the same time eliminates the current and pressure unbalance which the reactor would otherwise cause. This solution consists of short-circuiting the reactor with a fuse of such characteristics that it will carry the neutral current ordinarily encountered but will blow on 2,300-volt feeder trouble of such severity as to tax the rupturing capacity of the feeder oil breaker.

This company generates its 60-cycle power at 12,000 volts, delta. In the substations reduction is made to 2,300 volts star through delta-star-connected three-phase transformers. Distribution of the 2,300-volt energy is accomplished through four conductor feeders with induction regulators in the three-phase leads. The feeder neutrals are connected solidly to the ground bus in the substation. The transformer neutrals are bussed together and connected to this same ground bus through the neutral reactor, which has a reactance of 0.7 ohm. The fuse selected for short-circuiting the reactor was rated at 7,500 volts and 400 amp. The circuits are equipped with induction regulators having a range of 10 per cent plus and minus. They are also protected by overload relays which operate oil breakers rated at 300 amp. The maximum rupturing capacity of these breakers is around 4,500 amp. The combined impedance of transformers and reactor holds the maximum short-circuit current down to less than 3,000 amp., a value well within the rupturing capacity of the oil breakers. In fact, there have been



SHORT-CIRCUIT FUSE TEST ON 2,300-VOLT FEEDER

This oscillogram shows the value of the fuse (250 amp.) shunting the reactors on unbalanced circuits by lowering the short-circuit current when the fuse blows. No. 1 shows the circuit current, No. 2 the potential across circuit oil switch and No. 3 the potential across the reactor.

no oil-breaker failures since installation of the reactors.

As a try-out of the scheme by which the fuse shunts the neutral reactors it was arranged to short-circuit one phase of a 2,300-volt feeder at various distances from the substation and to take oscillograms of the current and voltages across reactor and oil breaker. The short circuit was fed from a 3,000-kva. transformer, fed in turn through two 1,700-ft., 500,000-circ.mil cables from 55,000 kva. in generator capacity.

The first test was made with the short circuit applied 8,500 ft. distant from the substation. For this condition the impedance of the short-circuited feeder amounted to 2.06 ohms and the current to only 930 amp. The 250-amp. fuse cleared in 4.2 cycles—3 cycles ahead of the opening of the oil breaker. The 400-amp. fuse did not blow. The protection of the reactor was clearly unnecessary for currents of this magnitude. With the short-circuit current increased to 2,650 amp., the 400-amp. fuse cleared in 2 cycles and the 250-amp. fuse in 1.9 cycles, or over 5 cycles ahead of the opening of the oil breaker. The accompanying oscillogram is for this test condition. With the clearing of the fuse, the reactor reduced the current of the short circuit from 2,650 amp. to 1,800 amp.

For the extreme condition of the short circuit applied within the substation, the short-circuit current amounted to 6,600 amp., or 47 per cent in excess of the maximum rupturing capacity of the oil breaker. This current was interrupted by the 400-amp. fuse within 1.5 cycles without sign of distress. The blowing of the fuse and consequent introduction of the reactor reduced the current to 2,600 amp., which current was interrupted by the oil breaker 6 cycles later. The pressure across the reactor after the blowing of the fuse amounted to 1,420 volts for this test condition.

The results obtained clearly indicate that a larger fuse might, if desired, be used without jeopardizing the protection afforded the oil breaker. A larger fuse capacity would leave a larger proportion of the mild cases of trouble to be cleared by the oil breaker alone.

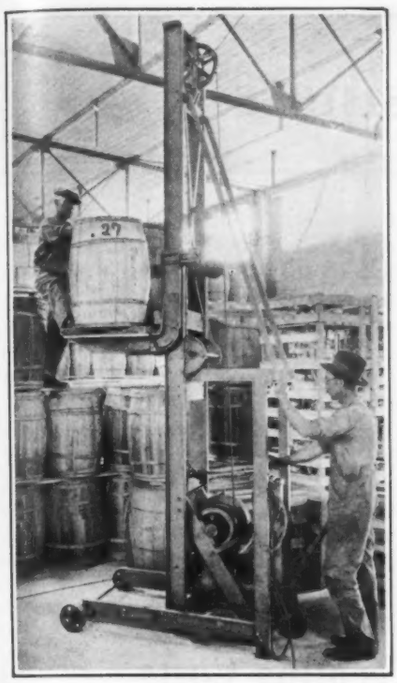
Stacker Saves Valuable Storeroom Space

BY J. M. BUSWELL
San Joaquin Light & Power Corporation, Fresno, Cal.

MAKING the most out of the floor space available in the new storeroom of the San Joaquin Light & Power Corporation, Fresno, Cal., is insured through the use of the stacker shown in the accompanying illustration. In this way the floor space practically to the height of the ceiling can be utilized.

The stacker used is of the heavy-power type manufactured by the Lewis-Shepard Company. It has a speed of 40 ft. per minute, with a load of 1,000 lb. The 2½-hp. motor is operated through a "dead-man" type of controller, and in addition there is an automatic limit stop at both top and bottom of the platform travel. The machine is thus foolproof and easily operated by inexperienced men without danger.

At least the salary of one man has been saved by the use of a stacker, representing probably $1,800 a year.



EXPENSIVE FIREPROOF WAREHOUSE SPACE SAVED BY THIS STACKER

It therefore paid for itself in less than two months in the labor costs alone. In addition it saves man power and effort and it prevents accidents.

One man on the floor operating the stacker and one man on the platform find it easy to stack barrels or boxes or take them down.

Dayton Tests Rubber Gloves Every Week

BY KARL H. BAUSMAN
Supervisor of Meters Dayton Power & Light Company

RUBBER gloves, which are required in conjunction with protective leather gloves by the Dayton Power & Light Company for work on all high-voltage circuits up to and including 6,600 volts, are tested every week for dielectric strength and leakage. About 150 pairs of gloves are out on the system, and these are required to be sent in the first of each week to the meter department in the service building in Dayton, where they are tested. Freshly tested gloves are issued the latter part of each week in exchange for the gloves sent in, so that the men are never without gloves which have gone longer than one week without test.

Responsibility for sending in these gloves is placed upon the supervisors of departments requiring gloves in their work, and the supervisors in turn distribute the responsibility among the foremen working under them. Gloves from the various districts are shipped to the service building by parcel post. To make certain that gloves are sent in regularly for test and to ascertain their performance, records are kept of persons responsible for sending in the gloves, the number of gloves, the identifying number on the gloves, the date they are sent, whether they break down or not, etc.

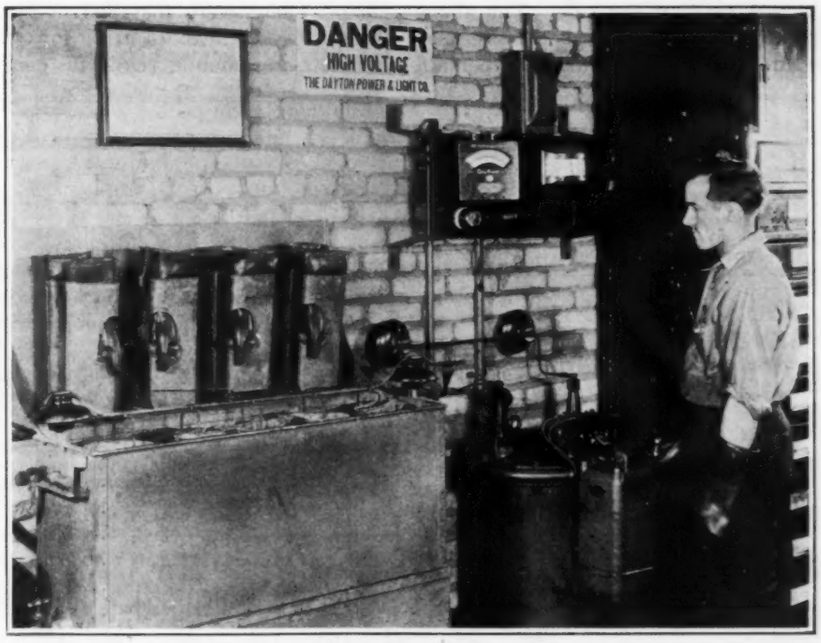
The gloves are tested in metal containers suspended in a tank of water accommodating five pairs of gloves, the gloves being filled with water to about 1½ in. of the top. The thumb of each pair of gloves passes through an opening in the metal container which holds the glove open and allows the water to touch all of the surface. This opening also holds the glove in position without creasing the rubber. The metal containers rest on the bottom of the tank.

Along the top of the tank and parallel to it runs a busbar supported on insulators at each end of the tank. This busbar is connected to one terminal of a 30,000-volt testing transformer which will gradually build up the voltage to 10,000 by turning a handle on the potential regulator. Wishbone-shaped metal saddles are hung over this busbar so that the tips project into the water in the glove, the water in the tank being energized at the opposite potential by being connected to the other terminal of the testing transformer and grounded.

During the dielectric test the potential on the gloves is built up to 10,000 volts and maintained at this value for one minute. Gloves failing to withstand this test are removed and their numbers recorded, as previously mentioned.

Following the voltage breakdown test, the wishbone-shaped metal saddles are removed and electrical contact is made inside each glove separately by pressing a metal electrode with an insulating handle against the busbar and inserting the end in the water within the glove. The voltage is then brought up to 10,000 and the milliampere leakage observed for each glove by quickly opening and closing a knife switch which connects a milliammeter in the grounded wire. This switch short-circuits the milliammeter and is normally kept closed during the breakdown test to protect it from damage in case of breakdown or excessive milliampere leakage. No glove is reissued for service which has a leakage in excess of 15 milliamperes. To new gloves a dielectric acceptance test at 10,000 volts is given for one minute with a maximum allowable leakage of 6 milliamperes.

The average time to make the complete tests is about four and one-half minutes per pair of gloves. After they are tested they are hung up to dry and finally powdered with soapstone. Some gloves, with careful usage, have lasted as long as two or three years; others may serve only a short time.



RAISING VOLTAGE ON GLOVES IN TANK TO TEST DIELECTRIC STRENGTH

Central Station Business

All Employees Act as Salesmen

By H. C. Rice
Appliance Sales Agent Southern California Edison Company

BECAUSE of the emergency caused by the power shortage during the summer and early fall months of this year, the Southern California Edison Company's appliance sales fell off considerably below normal. To stimulate and create interest among employees the following plan was put into effect October 15, 1924: Instead of hiring and training new salesmen it was decided to permit every employee on the company payroll to sell home labor-saving appliances. As compensation for their efforts a schedule of commissions was offered which has proved very attractive.

On all sales made by office employees a commission of 10 per cent is to be paid—5 per cent going directly to the person making the sale and 5 per cent to be pooled, the pool to be divided among the employees in the office who do not come in contact with the public yet whose work will be increased by the added sales. A commission of 10 per cent will be paid on outside sales, the entire amount going directly to the person making the sale. The above commissions will apply on regular standard stock. In addition, certain appliances that have become shopworn or obsolete will be classed as such and a commission of 15 per cent will be paid. In the case of office sales this commission will be split between the person making the sale and the pool, as on regular sales, and in the case of an outside sale the entire 15 per cent will go to the person making the sale.

To further stimulate interest each district office was given a quota of sales to be made between October 15 and January 1. As soon as this quota shall have been reached all commissions will be increased 50 per cent. This quota was purposely set low so that it will be easy for each district to make its allotted number of sales and participate in the increased commission. This scheme should be doubly effective in view of the holiday trade, which makes selling easy, and will also enable employees to make additional money for Christmas spending. The first week's trial indicates that the plan will be a success, as sales increased 50 per cent over those of the previous week.

Electric Heat-Treating Costs

IN HEAT-TREATING work the cost of electric operation is not the only important element to be considered. Other items, such as the improved product, greater flexibility of control and better working conditions, favor the use of electricity. From this standpoint central-station power salesmen should interpret the accompanying figures on heat-treating costs obtained from the Standard Equipment Company of Cleveland through the courtesy of D. F. Domizi, chief engineer.

This company has been using four 30-kw. heat-treating furnaces since 1920. These were installed at that time because heat treating of the complete automobile rear-axle gears required very close temperature regulation. With oil heat-treating furnaces difficulty had been experienced in controlling the air mixture necessary to hold a uniform temperature. But with electric control on two case-hardening furnaces a temperature of 1,650 deg. to 1,700 deg. F. can readily be maintained. This is checked and controlled by a Leeds-Northrup instrument. These furnaces, one of which is shown in the accompanying illustration, are of the General Electric type, have an interior dimension of 4 ft. x 10 ft., and use nickel-chromium elements, $\frac{7}{8}$ in. x $\frac{3}{32}$ in., mounted on the side walls. With an 18-in. fire wall sufficient heat retention is provided to insure that

TABLE I—COST DATA ON CARBURIZATION WI

Date	April 1	2	5	6	7	8	9	11	12	13	14	15	16	18
No. gallons	162	144	264	162	345	72	144	239	192	159	216	144	216	
Cost	$16.20	$14.40	$26.40	$16.20	$34.50	$7.20	$14.40	$23.90	$19.20	$15.90	$21.60	$14.40	$22.33	$7.4
Cost per pound	$0.0203	$0.019	$0.0108	$0.034	$0.018	$0.013	$0.025	$0.013	$0.018	$0.016	$0.024	$0.023	$0.018	$0.01
Pounds	797	734	2,433	457	1,839	549	584	1,842	1,036	961	904	612	1,221	45
Pieces	1,043	386	723	186	1,010	120	433	526	553	233	612	163	385	9

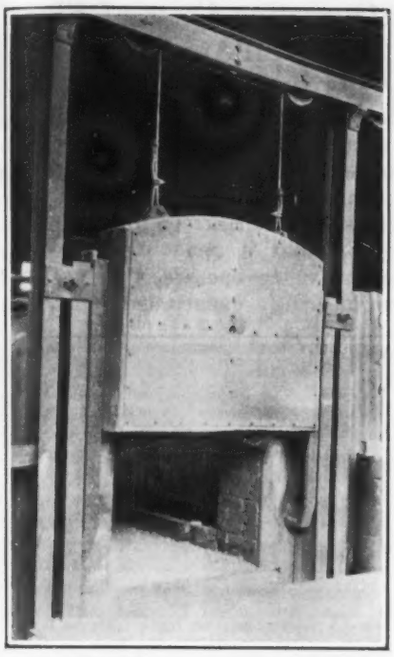
TABLE II—CARBURIZATION IN ELECTRIC FURNACE AT AN AVERAGE COST OF TWO

Date	May 1	2	3	4	5	6	7	9	10	11	12	13	14	16	17	18
Kw.-Hr	214	1,101	960	794	745	672	877	844	883	869	910	890	1,127	1,125	800	97
Cost	$4.81	$24.79	$21.58	$17.86	$15.76	$15.12	$20.19	$18.99	$19.87	$19.55	$20.48	$20.02	$25.24	$25.35	$18.00	$17.2
*Cost per pound	Heating	$0.04	$0.052	$0.017	$0.018	$0.0132	$0.042	$0.0201	$0.0314	$0.024	$0.025	$0.0176	$0.024	$0.022	$0.0128	$0.01
Pounds	Heating	618	401	1,051	858	1,136	481	937	632	791	797	1,139	1,037	1,115	1,400	99
Pieces	Heating	241	553	479	847	932	306	709	806	487	†240	429	902	747	1,327	81

* Variation in cost is due to length of operating periods and number of pieces treated. † Fourteen hours' special work.

TABLE III—COST OF HARDENING IN ROTARY

Date	Feb. 11	12	14	15	16	17	18	19	21	22	23	24	25	26	28	March 1
Kw.-Hr	611	782	641	351	533	530	603	569	634	595	605	570	615	733	614	59
Cost	$12.09	$15.48	$12.69	$6.94	$10.55	$10.49	$11.93	$11.266	$12.55	$11.78	$11.98	$11.28	$12.18	$14.51	$12.15	$11.8
Cost per pound	$0.0286	$0.061	$0.0196	$0.0094	Heating	$0.0131	$0.048	$0.0619	$0.0217	$0.0210	$0.0302	$0.048	$0.016	$0.0616	$0.0157	$0.025
Pounds	423	252	646	733	Heating	801	247	182	572	556	396	235	758	232	775	50
Pieces	342	754	692	2175	7 hr.	1,565	455	2,610	802	2,372	145	365	403	2,487	449	53



THIRTY-KILOWATT ELECTRIC FURNACE FOR CARBURIZING STEEL GEARS

after standing closed for a week an oven temperature of 800 deg. will be still available. They are three-phase, star-connected and operated at 220 volts.

In order to provide carburization of nine-tenths of 1 per cent carbon into the gears and pinions only three heats can be run every twenty-four hours. A comparison of the cost on carburization with oil furnaces as against electric is shown in Tables I and II. Although the relative costs per pound of metal heat-treated in the electric furnaces may on an average be greater than with oil, there are other considerations which make the use of the electric furnaces desirable. The quality of the product, the fact that there are fewer "rejects," the continuity of operation and the flexibility of control on the electric furnace far outweigh the operating expense. In other words, the cost per pound from an energy basis is not indicative of the true conditions of operation.

The two other 30-kw. electric furnaces, of the rotary cylindrical type, are used in this plant for toughening the gears and pinions. These furnaces operate at a temperature of 1,380 deg. to 1,400 deg. F. Each has a rotating table, 30 in. in diameter, operating at a speed of 10 in. per minute and driven by a 1½-hp. 1,200-r.p.m. motor mounted on the top of the furnace. These furnaces were designed and built by Mr. Domizi of standard refractories and standard heating elements. While experience with the design has shown that a lower heat loss can be obtained by improving construction, he obtained the operating costs as in Table III.

Results obtained with these furnaces have proved that the investment was well made because of their ability to turn out a more uniform product with lower over-all operating costs and fewer rejected pieces.

Utility's Office Serves as Theater Box Office

BY MAINTAINING a box office adjacent to its cashier's window for the advance sale of theater tickets the Merchants' Heat & Light Company of Indianapolis is providing an unusual service to the public. As the principal playhouse in the city is situated at a considerable distance outside of the main commercial district it was formerly necessary for theater patrons to go out of their way to purchase tickets. The new location of the box office on the company's main floor is a great convenience to theater-goers and is proving an excellent method of building good will for the company and thus bettering public relations.

Texas Company Sets New Appliance Sales Record

MERCHANDISE sales for the months of June and July on the system of the Texas Power & Light Company totaled more than $130,000, this being the highest figure for any two months recorded since the company engaged in the sale of appliances. Sales for the first seven months of 1924 were 25 per cent greater than during the same months of last year.

Electric range sales far exceeded the bogey set for these two months. Several successful campaigns were conducted during the period. Thirty-two ranges were sold in two small towns during a ten-day period, sixteen were sold in one week in a district containing 1,426 residential customers, and thirty-five sales were made in west Texas towns during the same time. During a fifteen-day campaign in a town of 1,823 residential customers forty-one electric ranges were sold.

The washing-machine sales crew, stimulated by the range crew, boosted its sales considerably during June and July. In one district with a little more than 2,000 residential customers forty-seven washing machines were sold during a ten-day campaign.

Electric sign sales also jumped as a special effort was put forth to sell signs during the time when everybody said they could not be sold on account of the hot weather and long daylight hours. Ten large electric signs were sold during this period as well as several commercial lighting jobs. In addition, several store-lighting installations were changed to better equipment.

Recently a sales meeting was held in Dallas, attended by the crew leaders, sales supervisors and several of the district salesmen, at which plans were gone over and adopted for increasing sales during the remainder of the year. Each year the company sets a bogey for its merchandise sales. Month to month progress is watched closely, so that if sales slow up at any point steps can be taken to bolster up the weak spots. The company's 1924 bogey shows the following results: Number of residential customers, 55,873; merchandise bogey per residential customer, $9.10; gross merchandise sales per residential customer for seven months, $6.05. It will be seen that at the end of seven months sales were 17 per cent ahead of schedule.

IL FURNACES

19	20	21	22	25	26	27	28	29	30
144	198	216	216	72	72	144	144	144	72
$14.88	$20.47	$22.34	$22.34	$7.44	$7.44	$14.88	$14.88	$14.88	$7.44
$0.0175	$0.015	$0.016	$0.0164	$0.021	$0.0218	$0.019	$0.0218	$0.021	$0.019
841	1,369	1,402	1,379	350	342	782	687	715	390
557	486	839	877	127	579	1,877	424	812	87

ENTS PER POUND

19	20	21	23	24	25	26	27	28	31
953	932	485	1,045	1,065	1,040	945	913	524	704
$21.44	$20.97	$10.91	$23.51	$23.95	$23.40	$21.26	$20.54	$12.70	$15.84
$0.012	$0.02	$0.009	$0.021	$0.013	$0.013	$0.029	$0.0153	$0.023	$0.037
1,786	1,031	1,210	1,080	1,876	1,768	718	1,336	538	409
1,550	408	2,029	1,157	595	1,290	2,543	3,308	284	2,475

LECTRIC FURNACE

2	3	4	5	6	7	8	9	10	11
626	631	506	147	548	657	621	615	583	643
$12.39	$12.50	$11.94	$2.91	$10.79	$12.91	$12.29	$12.18	$11.54	$13.92
$0.0213	$0.0151	$0.0226	$0.0112	Heating	$0.0197	$0.0133	$0.0264	$0.0202	$0.0185
581	826	527	260	Oven 8 hr.	660	925	461	572	765
730	702	914	591		498	164	2,428	1,362	555

Data on Electric Refrigerator Performance

SOME interesting data on the individual performance of electric refrigerators in use in the homes of its customers is being collected by the Kansas City Power & Light Company. During the last year a number of Kelvinator machines have been installed in the city, and the company is making a study of what this device means in added consumption and increased revenue. In the accompanying tabulation data covering the first seven months of this year are given from eight separate installations.

In this connection it should be noted that the residential rate of the Kansas City Power & Light Company is such that it tends to encourage the use of appliances. The rate is the Wright demand type on a room basis with energy charges per kilowatt-hour as follows:

7.5 cents for the first 5 kw.-hr. per room.

5.0 cents for the next 5 kw.-hr. per room.

2.5 cents for all excess.

In order to determine just how much energy is used by the refrigerator, the company has set a sub-meter on the customer's premises so as to record only the kilowatt-hours required by the machine. In the tabulation these figures are shown under the heading "Sub-Meter Kw.-Hr." The main meter registers the total consumption for lighting and all appliances, including the refrigerator.

In analyzing the cost per kilowatt-hour consideration must, of course, be given to the number of rooms for which the customer is required to use the first 5 kw.-hr. at 7½ cents and the next 5 kw.-hr. at 5 cents.

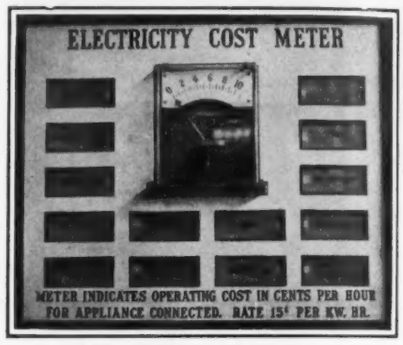
A study of the amount of energy used by the refrigerators shows quite a wide variation for the same months, which is easily accounted for by the fact that the conditions of installation, room temperature, etc., and individual habits of the families differ considerably.

The generally low cost of refrigeration is most encouraging. The highest cost of the Kelvinator operation for one month was $4.13 for Customer E, whose energy consumption was 94 kw.-hr., earning a 4.4-cent rate. The next highest cost of operating the refrigerator was that of Customer A, who used 114 kw.-hr. for the month ending July 10 at a cost of $3.65 and an average rate of 3.2 cents. Other customers show costs of operation running as low as 10 cents for the use of 4 kw.-hr. In no case is the cost for energy greater than would be the cost of ice for a family living in a house of the size indicated. In fact, it seems unlikely that the ice bill in a twelve-room house (Customer A) would be as low as $3.65, and certainly, it would not be as little as $1.50 to $2.50 in an eight-room or nine-room house.

The Kansas City Power & Light Company's rate encourages a liberal use of the refrigerators, and from the data here presented a good idea may be had of what can be expected in energy consumption.

Operating Costs of Electrical Appliances

CUSTOMERS about to purchase new electrical appliances are interested in what it will cost to operate them, particularly where the prospective buyer has had no previous experience. To allay the suspicion that electric appliances are expensive to operate, the electrical engineering department of Iowa



METER CALIBRATED IN CENTS PER HOUR

State College prepared a cost meter. The meter is an ordinary wattmeter, recalibrated, mounted on a board which has illuminated signs for all kinds of appliances as illustrated. The appliances themselves were placed in front of this board and connected to the wattmeter with a rotating switch. When the appliance was turned on, a red light showed up behind the sign and swung the wattmeter needle over to the number of cents per hour required to operate that appliance at a 15-cent rate, which is the average for many Iowa towns.

ENERGY CONSUMPTION AND COST OF OPERATING DOMESTIC ELECTRIC REFRIGERATORS

Meter Reading Date	Main Meter, Kw.-Hr.	Total Net Bill	Sub-Meter, Kw.-Hr.	Net Bill Without Kelvinator	Difference, Cost of Kelvinator	Resultant Rate Cents
Customer A (No. of rooms, 12; turning point, 60):						
Jan. 9.....	352	$13.30	No reading	....	....	....
Feb. 9.....	250	10.75	40	....	....	....
Mar. 9.....	166	8.65	38	$7.70	$0.95	2.50
Apr. 9.....	216	9.90	54	8.55	1.35	2.50
May 9.....	182	9.05	64	7.45	1.60	2.50
June 10....	202	9.55	98	6.70	2.85	2.85
July 10.....	202	9.55	114	5.90	3.65	3.20
Customer B (No. of rooms, 8; turning point, 40):						
Jan. 10.....	236	$8.90	...	....	....	....
Feb. 9.....	212	8.30	...	....	....	....
Mar. 10....	192	7.80	(Sub-meter set 2-27-24)	...	....	....
Apr. 9.....	192	7.80	90 (out)	....	....	....
May 9.....	170	7.25	62	$5.70	$1.55	2.50
June 10....	136	6.40	68	4.40	2.00	2.94
July 10.....	124	6.10	68	3.80	2.30	3.38
Customer C (No. of rooms, 8; turning point, 40):						
Jan. 1.....	244	$9.10	...	....	....	....
Feb. 1.....	238	8.95	38	....	....	....
Mar. 1.....	194	7.85	40	$6.85	$1.00	2.63
Apr. 1.....	200	8.00	22	7.45	.55	2.50
May 1.....	150	6.75	58	5.30	1.45	2.50
June 2.....	152	6.80	42	5.75	1.05	2.50
July 2.....	184	7.60	4	7.50	.10	2.50
Customer D (No. of rooms, 9; turning point, 45):						
Jan. 14.....	90	$5.63	10	....	....	....
Feb. 9.....	74	4.83	24	$3.63	$1.20	5.00
Mar. 10....	74	4.83	30	3.33	1.50	5.00
Apr. 9.....	72	4.73	34	3.03	1.70	5.00
May 9.....	74	4.83	44	2.26	2.57	5.85
June 10....	96	5.78	54	3.16	2.62	4.85
July 10.....	Out of city					

Meter Reading Date	Main Meter, Kw.-Hr.	Total Net Bill	Sub-Meter, Kw.-Hr.	Net Bill Without Kelvinator	Difference, Cost of Kelvinator	Resultant Rate Cents
Customer E (No. of rooms, 9; turning point, 45):						
Jan. 11.....	106	$6.03	4	$5.93	$0.10	2.50
Feb. 9.....	104	5.98	12	5.68	0.30	2.50
Mar. 9.....	74	4.83	4	4.63	0.20	5.00
Apr. 8.....	86	5.43	18	4.53	0.90	5.00
May 8.....	126	6.53	82	3.31	3.22	3.93
June 9.....	168	7.58	116	3.73	3.85	3.32
July 10.....	126	6.53	94	2.40	4.13	4.40
Customer F (No. of rooms, 8; turning point, 40):						
Jan. 4.....	332	$11.30	...	....	....	....
Feb. 2.....	320	11.00	...	....	....	....
Mar. 3.....	292	10.30	58	$8.85	$1.45	2.50
Apr. 1.....	260	9.50	58	8.05	1.45	2.50
May 2.....	162	7.05	62	5.50	1.55	2.50
June 4.....	184	7.60	62	5.80	1.80	2.50
July 3.....	Out of city					
Customer G (No. of rooms, 10; turning point, 50):						
Jan. 12.....	396	$17.40	...	....	....	....
Feb. 11.....	186	8.40	...	....	....	....
Mar. 11.....	172	8.05	...	....	....	....
Apr. 10.....	152	7.55	54	....	....	....
May 10.....	166	7.90	50	$6.65	$1.25	2.50
June 12.....	168	7.95	76	5.85	2.10	2.76
July 11.....	130	7.00	50	5.25	1.75	3.50
Customer — (No. of rooms, 8; turning point, 40):						
Jan. 7.....	156	$6.90	...	....	....	....
Feb. 6.....	142	6.05	...	....	....	....
Mar. 6.....	112	5.80	...	....	....	....
Apr. 5.....	134	6.35	56	$5.95	$1.40	2.50
May 6.....	94	5.35	56	2.90	2.45	4.37
June 6.....	96	5.40	58	2.85	2.55	4.40
July 5.....	114	5.85	72	3.10	2.75	3.82

Digest of Electrical Literature

Hydro-Electric Development and Steam Equipment

Pulverized Fuel.—This thirty-two-page pamphlet is the serial report of the sub-committee on pulverized fuel of the prime movers committee of the N. E. L. A. It shows the remarkable increase and progress in the use of pulverized fuel, as indicated by the fact that it is now considered in the design of practically every coal-burning central station. Many refinements in the design and reliability of apparatus have been accomplished. The boiler water screen, the radiant type of superheater and waste-heat coal drier, all recent developments, have been quickly adopted. Various statements of operating companies and manufacturers indicate the progress, present trend in design and results obtained with this comparatively new method of burning coal. Abstracts of articles appearing in the foreign press show the progress made in Europe. A bibliography of articles published in this country is also included.—*Publication No.* 24-79 *of the N. E. L. A.*

Drying of Peat for Power Production.—G. K. FLETCHER.—Taking the calorific value of anhydrous peat at 9,500 B.t.u. per pound, the author first shows the net value for wet peat of various moisture contents, and since the quantity of water originally present may range between 80 per cent and 95 per cent the result is very low. If the drying is to be accomplished by the evaporation of water, then, to be commercially practicable, it will be necessary to economize the heat by (1) utilizing for drying heat of low grade, valueless for other purposes; (2) reducing the total quantity required to evaporate a pound of water; (3) utilizing the steam produced, before condensing, (4) recovering the heat from the evaporated water. Each possibility is examined, and a process is suggested for bleeding steam from a high-pressure turbine, using this steam to convert the water in the peat into steam, which in turn is used to generate steam from pure water, suitable for use in a low-pressure turbine. The thermal advantages and the practical difficulties of such a scheme are discussed in detail.—*World Power*, September, 1924.

Generation, Control, Switching and Protection

Character of Discharge of Aluminum and Oxide-Film Lightning Arresters.—J. OKOCEI.—In order to study the behavior of aluminum and oxide-film lightning arresters, a Braun tube oscillograph was used. According to the author, the aluminum cell is superior as a lightning arrester, because its discharging characteristic does not fall off and it has a large condenser action, and also its discharge is not so sudden as the oxide film, thus producing less electric oscillation. Experimental data on which these conclusions are based are given.—*Journal of the Institute of Electrical Engineers of Japan*, No. 434.

Supervisory Systems for Remote Control.—J. C. FIELD.—In order that the load dispatcher may know exactly the conditions of any piece of equipment on his system, the supervisory system for remote control of power has been developed. Outside of being of service as a centralized information point, the supervisory control also performs the operation. A general description of the supervisory control system as developed by the Western Electric Company is included.—*Electrical Communication*, October, 1924.

Extinction of Fires in Generators by Means of Carbon Dioxide.—CHARLES L. JONES.—After reviewing the various methods that have been advocated for extinguishing machine fires, the author describes experiments conducted on pieces of generator coil in a closed box, so contrived that the various influences could be individually studied. Carbon dioxide was used as the extinguisher. The effects of windage, gas composition, leakage, air temperature and copper temperature and the presence of several kinds of insulating material are discussed. The general conclusion is that with a closed air circuit the addition of 25 per cent of carbon dioxide to the air will immediately extinguish surface fires if precautions are taken against undue leakage. The glowing spots of carbon will die out quickly with the stopping of the machine and consequent cessation of the blast. The article is illustrated. — *General Electric Review*, October, 1924.

Transmission, Substations and Distribution

Insulator Cement.—A. BÜLTEMANN.—Electric line insulators made of porcelain and cemented on the metal supporting pin show very frequently a cracking or even bursting of the porcelain after several months' exposure to the elements. This is due to "driving" of the cement, which may be caused either by expansion of the cement or by its absorption of water from the air. Experiences with a newly discovered cement covering now six years seem to indicate a very marked improvement. It has been found that ordinary cement to which has been added pitch in a state of very fine, colloidal powder, and which after setting is heated to above 150 deg. C., will assume a form in which the smallest individual particles are surrounded by a film of melted and hardened pitch. This makes the cement practically impervious to water and gives it at the same time a certain amount of resilience. This cement, called "permanit," after lying in water for twenty-four hours, absorbs only about 0.05 per cent of water and, tested as a dielectric, cannot be punctured by 10,000 volts in a plate of ¼-in. thickness. The cement is not affected by boiling hydrochloric acid. — *Elektrotechnische Zeitschrift*, Sept. 25, 1924.

Hyperbolic Method of Transmission-Line Solution.—H. WADDICOR.—In the preceding part of this article the author showed how hyperbolic functions are used in computing conditions at the ends of the line. In the present installment he examines the distribution of potential and current along the line for three conditions—the line short-circuited or grounded, loaded and open-circuited respectively. Numerical results are worked out for an assumed 300-mile line.—*World Power (England)*, September, 1924.

High-Voltage Impregnated Paper Cables.—W. A. DEL MAR and C. F. HANSON.—This paper describes methods that have been developed for the testing and control of raw materials and manufacturing processes whereby it has become possible to produce cables having a dielectric strength of 200 kv. per cm. The illustrations include views of apparatus and performance-charts of cables.—*A. I. E. E. Journal*, October, 1924.

Units, Measurements and Instruments

Power Measurements at High Voltages and Low Power Factors.—J. S. CARROLL, T. F. PETERSON and G. R. STRAY.—A description is given of apparatus for the measurement of power as low as a fraction of a watt at power factors approaching zero and voltages as high as 175 kv., using a standard make of wattmeter and a water-column multiplier. Erroneous indications in the original form were found to be due chiefly to capacitance effects caused by the shielding, which was reconnected so as to avoid them. Corona loss measurements were made on conductors having different diameters and degrees of roughness and under various atmospheric conditions. For the tabulated results and curves the reader is referred to the article itself, which contains in addition studies on insulator losses, wet and dry, and on losses by brush discharges.—*A. I. E. E. Journal*, October, 1924.

Testing of Transformer Oils.—STEPHAM MOER.—This paper discusses the chemical properties of transformer oils, with special reference to the methods of analysis in use by the different manufacturers and users of transformer oils.—*Meddelelser fra Norske Elektricitetsverkers Forening*, October, 1924.

Illumination

Structure of Light.—J. J. THOMPSON.—There has been a great deal of contradiction between the evidence as to the nature of light afforded by its optical properties on the one side and its electrical ones on the other. There has been no agreement between the prediction of theory and the results of searching and accurate experiments in the undulatory theory of light. When

the electrical properties of light are considered, everything points to a great concentration of energy into discrete centers and indicates that the front of a wave, instead of being as it were uniformly illuminated, is represented by a series of bright specks on a dark ground. The author considers the problem in a very comprehensive manner.—*Philosophical Magazine*, October, 1924.

History of Electric Light.—HENRY SCHROEDER.—A very complete history of the electric light since the early records of electricity and magnetism and up to the present-day development of manufacturing lamps on a production basis is given. This paper is ninety-five pages long and is profusely illustrated.—*Publication No. 2717 of the Smithsonian Institution.*

Motors and Control

Performance of Three-Phase Induction Motors.—T. F. WALL.—The purpose of this article is to investigate the effects of a change in the supply voltage on the performance of a motor. The author points out that the assumption of constant admittance is a defect of the circle diagram, especially near saturation, and gives approximate expressions for susceptance and conductance in terms of back emf. Taking a specific motor and applying formulas for primary current and torque, he works out the characteristics at normal as well as at higher and lower voltages. The resulting curves show that raising the voltage increases the efficiency at rated output but reduces the power factor, while reducing the voltage increases the efficiency and power factor at light loads. Supplying reduced pressure through an auto-transformer may involve a lowering of the total efficiency that will more than counterbalance the advantages of improved power factor.—*World Power (England)*, September, 1924.

Use of Aluminum Coils in Electric Motors.—Y. BALSLEW.—The author gives a comparison between aluminum and copper for windings in electric motors. He concludes that if the cross-section can be increased by about 70 per cent, there are decided advantages in the use of aluminum. Its application is feasible, therefore, in the rewinding of old motors without interpoles, brake magnets and lifting magnets.—*Teknisk Tidskrift (Sweden), Elektroteknik*, Oct. 4, 1924.

Heat Applications and Material Handling

Thermal Conductivity of Carborundum Refractories.—M. L. HARTMANN and O. B. WESTMONT.—Thermal conductivity measurements up to 1,350 deg. C. of silicon carbide refractory materials have been made, using the water calorimeter method. Data were secured on furnace walls, such as those commonly used in practice, and results are believed to be accurate to within about 1 per cent. Conductivity measurements were made on seven carborundum single walls and on eight carborundum-fireclay composite walls. The relation of the thermal conductivity to temperature, chemical composition and porosity was investigated, as well as the magnitude of the surface and joint effects. The conductivity of carborundum refractories was found to vary with the quantity of heat energy transmitted through the wall. Tables are given showing the coefficients of thermal conductivity and heat flow through various types of walls, with a temperature of 1,500 deg. C. in the combustion chamber.—*Paper presented before the American Electrochemical Society, Detroit*, Oct. 2-4, 1924.

Construction of Electric Furnaces for High Temperatures.—OTTO STALHANE.—The author describes a new type of furnace which represents a combination of the resistance and the arc types. The resistance is made of a chromium-nickel alloy and designed to bring the entire furnace to a temperature of about 850 deg. The arc is of the rotating type previously used in searchlamps. The rotation of the arc is produced by the magnetic field from the resistance element, which for this purpose is made in the form of a solenoid around the arc. The resistance element serves a third purpose in that it furnishes a stabilizing resistance for the arc.—*Teknisk Tidskrift (Sweden), Elektroteknik*, Oct. 4, 1924.

Electrophysics, Electrochemistry and Batteries

Using X-Rays to Detect Hidden Dangers in Plant Equipment.—H. H. LESTER, E. C. HERTHEL, W. MENDIUS and W. V. ISHIE.—This article, which is illustrated by reproductions of radiographs and etched sections, relates particularly to the discovery of defects in steel castings not to be found by the usual methods of inspection.—*Chemical and Metallurgical Engineering*, Oct. 20, 1924.

Electrical Sheet Steel.—Y. NIWA, J. MATURA and J. SUGIURA.—The magnetic properties of sheet steel under superposed alternating-field and unsymmetrical hysteresis losses are considered. The magnetic properties for sheet steel under superposed magnetic pulsation with sinusoidal exciting current are investigated and the hysteresis losses under such conditions determined. It is shown that the hysteresis loss, the amplitude of pulsation of the magnetizing force and the constant magnetizing force have linear relation among themselves in certain ranges of magnetizing forces. Dynamic hysteresis loops are determined by means of the cathode ray oscillograph.—*Research No. 144 of the Electrochemical Laboratory, Tokyo, Japan.*

Traction

Internal-Combustion Electric Locomotives. — HERMANN LEMP. — The author points out the characteristics and the advantages, under certain conditions, of the internal-combustion engine as prime mover on a locomotive with electrical transmission between it and the load. Where oil is burned under a boiler and fuel economy is the primary consideration rather than first cost the fourfold higher efficiency obtainable with internal-combustion engines should, in his opinion, lead to the gradual elimination of the steam locomotive. Specifications, operating data and illustrations are given to show present practice.—*General Electric Review*, October, 1924.

Electric Locomotive Used to Test Steam Locomotives.—An unusual application of the electric locomotive for determining the drawbar pull of a steam locomotive is described. The regenerative braking feature of the former is the basis of the method. Tests made on the steam locomotives built for the South Manchurian Railway are described.—*Railway Age*, Oct. 25, 1924.

Telegraphy, Telephony, Radio and Signals

Motional Mutual Impedance of Telephone Receivers.—H. NUKIYAMA and M. MATUDAIRA.—To investigate the vibration of the telephone diaphragm when the motional impedance is very small, the authors measured the motional mutual impedance between the winding of the receiver and a new winding attached to the diaphragm, the former acting as a driving coil and the latter as a measuring coil. By this method the mechanical impedance of carbon powder of a solid back transmitter was measured. The paper also contains the theory of the motional mutual impedance of the receiver and theory and experimental results of the determination of the mechanical constants of the vibrating system.—*Journal of the Institute of Electrical Engineers of Japan, No. 431.*

Experimental Determination of the Fundamental Dynamic Characteristics of a Triode.—E. TAKAGISHI.—By picking out the fundamental component only from the distorted current in a triode while functioning, the author has found, first, new forms of dynamic characteristics for a triode, which are utilizable for solving various problems not hitherto satisfactorily solved; second, that the grid current may reach a large value. Some experiments have been carried out relative to the voltage amplification factor, for which a new expression has been found.—*Proceedings of the Institute of Radio Engineers*, October, 1924.

Carrier Telephone Equipment for High-Voltage Power-Transmission Lines.—N. H. SLAUGHTER.—Carrier-current equipment has been developed or designed primarily from the standpoint of reliability as regards both its installation and operation. The development of this equipment has been founded on many years of experience in the over-arc of long-distance telephony and the application of carrier-current systems to telephone lines. One of the most important elements in any carrier-current equipment is the vacuum tube, which must have satisfactory characteristics. A general discussion of the application of carrier current to this service is given.—*Electrical Communication*, October, 1924.

Scientific and Industrial Research

[When investigations which have been completed are, in the opinion of the editors, of wide enough interest to the field we serve, details thereof will be presented in other parts of this paper. Contemplated research or that which appears to have limited appeal will be only briefly reported in this section, but details may be had by communicating with the investigator or institution named in the report. Readers are referred to the department "Digest of Electrical Literature" for investigations reported in other journals. The news and engineering sections should also be followed for research reported before technical societies.]

Suggestions for Research

Alloys, Aluminum

A notable achievement has been the complete explanation of the phenomena of age-hardening upon which the remarkable properties of duralumin and similar aluminum alloys depend. Special attention has been directed to the study of cast aluminum alloys, particularly to those which can be improved by heat treatment in the cast condition. In the case of Y-alloy a tensile strength of 26 tons per square inch has recently been obtained from the material in the chill cast condition, thus closely approximating to the best results obtainable from wrought light alloys. A discovery which promises to be of great importance industrially is the effect of small additions of calcium in improving the electrical conductivity of aluminum containing silicon.—*Department of Scientific and Industrial Research, London, S. W. 1, England.*

Crane, Dynamic Braking for

The 50-ton electric crane on the side of the cliff at the hydraulic plant of the Niagara Falls Power Company has been used for lowering large runners of the water turbines about 230 ft. The crane was originally equipped with friction brakes which heated so rapidly that the operator had to stop the hook many times during each down trip to wait for them to cool. It took four hours and sometimes even longer to make one trip down. Not long ago dynamic braking control was installed and now it takes only twenty-four minutes to lower a 50-ton load.—*Electric Controller & Manufacturing Company, Cleveland, Ohio.*

Electrostatic Voltage Multiplier

If a condenser of capacitance C_1 is charged by a quantity of electricity Q to a voltage V_1 and then the capacitance is reduced to a value C_2 the voltage increases to a value V_2, where $Q = V_1C_1 = V_2C_2$. A device based on this principle has been actually built for maintaining the potential in an ionization chamber at about 2,000 volts from a 100-volt source. For details see *Journal* of the Optical Society of America, 1924, Vol. 9, page 345.—*A. W. Simon, University of Chicago.*

Light Meter, Use of, in Checking Radium Luminous Material

A special application of our foot-candle meter has been made by a manufacturer of radium luminous material. By measuring the brightness of samples of this material its quality can be maintained to a standard. The brightness of this material varies from 1 to 100 microlamberts. A special form of instrument measuring 150 c.m. in length has been made so that the low brightness can be measured directly without the use of filters.—*Holophane Company, New York, N. Y.*

Paints, Standardization of

After much study, it has become possible to standardize the colors to be used on the work of the commission to twenty-four, applicable to the work of all departments. This will greatly simplify both the testing and purchasing of paints and will promote uniformity in the appearance of structure, equipment and rolling stock.—*Hydro-Electric Power Commission, Toronto, Canada.*

Relay, Thermal

To protect a circuit against an overload, the main current is made to pass through bi-metallic U-shaped strips. These strips are warped by heat and their motion is transmitted through a rod to the circuit breaker, which is thereby opened. This protection is preferable to fuses in that it permits a much longer time-element, which is desirable with motors.—*Brown, Boveri & Company, Baden, Switzerland.*

Resistor Units, Enameled

The new units have a high-heat-resisting silicate compound body which will withstand extreme temperature fluctuations without cracking or weakening. A resistor may be plunged red hot into ice water without cracking the enamel.—*General Electric Company, Schenectady, N. Y.*

Screw Testing, Interferometer for

Two mirrors are mounted on separate carriages transported by separate nuts placed at two points of the screw under test. As the screw is rotated errors of run and periodic errors appear as progressive and periodic displacements respectively of the white-light fringes—*Gaertner Scientific Corporation, Chicago, Ill.*

Welding, Spot, Aluminum or Duralumin

The writer has spot-welded many pieces of aluminum and duralumin, but this is only accomplished by placing the superposed pieces of metal to be united between sheets of resistance material, usually steel, and applying welding electrodes to opposite faces of said sheets under pressure. This generates a welding heat at a spot or spots in the pieces to be united, due both to the heat created in the pieces by the welding current and to the heat conducted from the sheets of resistance material to the pieces to be united. The resistance material should be of greater electrical resistance than either the pieces of metal to be united or the electrodes. It is also desirable that the resistance material should have a lower heat conductivity than the pieces to be united, so as to keep the heat generated in the resistance material.—*J. W. Meadowcroft, Philadelphia, Pa.*

In Progress or Purposed

Agriculture, Electricity in

Research is being made on new uses of electricity on the farm. Among the subjects under consideration are refrigeration, dehydration, power for preparing the seed bed and power for cultivating and harvesting crops.—*State Experiment Station, Auburn, Ala.*

Electrodeposition

Accounts of the work done by the Royal Army Ordnance Corps on the derusting and depainting of materials by electrolytic means and on the repair of worn parts by electrodeposition have been published. Conferences of technical representatives of the fighting services are taking place at which problems of electrodeposition as well as general metallurgical problems of interest to the services are discussed.—*Research Department, Woolwich Arsenal, England.*

Ferrous Alloys, Density of

Numerous requests have recently been received for the density values of carbon and alloy steels in varying conditions of work and thermal treatments. Accordingly plans were made to study the effects of composition, mechanical and thermal treatments upon the density of iron and steel. A large number of specimens suitable for density determinations are now available and these will first be assembled; subsequently additional material will be secured to fill any gaps which may exist. Laboratory work should begin soon.—*Bureau of Standards, Washington, D. C.*

Insulator-Testing Device

Attention has been given to the development of an insulator-testing device for use on live lines, and present results indicate that a very simple device may be made which will be at least equal to, if not better than, any device at present available.—*Hydro-Electric Power Commission, Toronto, Canada.*

Strain Gage, Electric, for Study of Mass Concrete

In co-operation with the Engineering Foundation, the design of a carbon resistor cartridge for measuring deformation in mass concrete has been undertaken, with particular reference to the study of arch dams. An experimental cartridge is now undergoing laboratory trials to determine temperature and other effects. It is planned to embed a number of these cartridges in concrete with a view of determining the effects of shrinkage and other factors as an aid to interpreting results obtained in field work.—*Bureau of Standards, Washington, D. C.*

Thermionic Valve, Researches on

The following investigations are being carried on audion vacuum tubes: (a) accurate measurement of the amplification factor; (b) forced life testing and gradual alteration during life; (c) exhaustion of metal vessels and a high-speed all-metal vacuum pump.—*National Physical Laboratory, S. W. 1, London, England.*

Research Completed

Cables, Direct-Current, Testing of, with Kenotron

The general acceptance of direct-current testing depends greatly upon the amount of information that is gathered as to the proper ratios of direct current to alternating current to use under different conditions. The data which will be furnished from the experience of the operating companies and researches at various laboratories will probably solve this problem as satisfactorily as any insulation problem can be solved.—*Underground Systems Committee of N. E. L. A.*

Photometry Based on International Visibility Data

At the session of the International Commission on Illumination held in Geneva, Switzerland, in July, 1924, visibility data were adopted which were recommended in the Scientific Paper No. 475 of the United States Bureau of Standards. The international adoption of these data on visibility of radiation opens the way for experimental work which should eventually lead to agreement on exact values for standards of candlepower of different types and on the methods of photometry for comparing the brightness of lights of different color.

Ranges, Electric, Load Characteristics of

The use of electric ranges for cooking purposes has increased in some communities to such an extent as to necessitate a thorough study of their characteristics as a central-station load. In particular, information is desired on the power demand, annual energy consumption, diversity factor, cost of range service, effect on the distributing system, etc. For some preliminary surveys in this direction see the N. E. L. A. report on *"Electric Cooking and Heating,"* No. 24-22B.

Vacuum Indicator, Hot-Wire Type

Convection of heat is zero in absolute vacuum and increases with gas pressure. A conductor made of a material of high resistance - temperature coefficient and heated by a constant current will assume the higher temperature in corresponding degree with the perfection of the vacuum. By having two conductors in bridge connection the effect of the ambient temperature can be eliminated and a galvanometer can be directly calibrated in gas pressures. For a device of this kind see *Brown-Boveri Mitteilungen*, 1924, Vol. XI, page 161.

News of the Industry

Dr. Ferranti Feted

Noted English Engineer Felicitated by Founder Societies at Luncheon in His Honor

ON THURSDAY of last week Dr. S. Z. de Ferranti, noted English engineer, past-president of the Institution of Electrical Engineers and an honorary member of the American Institute of Electrical Engineers, was honored by a luncheon given for him at the Yale Club, New York City, by the A. S. C. E., A. S. M. E., A. I. E. E. and A. I. M. E. J. W. Lieb acted as toastmaster, and, besides Dr. Ferranti's address, speeches were made by F. R. Low, president of the A. S. M. E.; Alex Dow, representing the A. S. C. E.; Calvert Townley, past-president of the A. I. E. E., and J. V. W. Reynders, president-elect A. I. M. E.

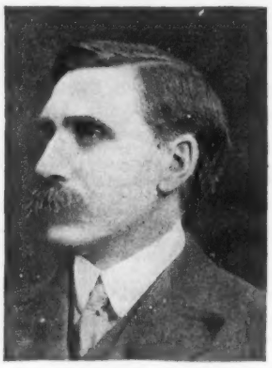
Dr. Ferranti, who spent a month in this country visiting the great power stations of Chicago, Detroit and New York and who sailed for home last Saturday on the S.S. *Majestic*, made a very happy speech expressing his appreciation of the honor shown him and conveying expressions of friendship and good will from the Institution of Electrical Engineers of Great Britain. Among other things he said:

"Engineering is really one. We are all endeavoring to do much the same thing, to give to the people that which they could not very well get without us. Engineering is the accomplishment of great things for the benefit of the community. The work of the engineer is to do these things on such a scale and at such a cost that they may become generally available to the whole community.

"We have all been engaged in one way or another in developing the resources of nature for the public good. We have all gone along our own particular lines to do this, but all those different ways have had to be followed to accomplish the results that have been obtained so far and to provide that development in the future which we all wish to see.

"In the very early days I pursued the line of electrical development because it then seemed to me that it was in this direction that I should find the greatest opportunity, and later on I found the idea forcing itself more and more upon me that we must come to a position in which electricity must be used for our very great benefit. In fact, I had the hope and the desire to see a time when everything would use electricity to its advantage, when electricity would be developed and broadened so that it could give every service.

"You remember how at first electricity was used for telegraphy, how later on the wonderful invention of the telephone was made and the immense advantage that was to the community;



S. Z. DE FERRANTI

how as we progressed we came to electric lights; how later we came to electric power, to electrochemical work, to electric heating and cooking and all the other different uses to which electricity can be put.

"I am sure you will agree with me that electricity is the greatest possible labor saver, and it is in the saving of labor that we all see the opportunity for the desire of the community to be realized, namely, to live to a higher standard with greater ease. It is only by the work of each individual producing more that the community can hope to get to and live at this higher standard. And you can only look at it in that way when we have more automatic machinery, things which will do with less labor more of what we require, will fill more of our wants, that we can then get to this higher standard of living which is the desire of the vast masses who feel that they have not enough of the good things of this world.

"Electricity is the greatest labor saver that we know, and therefore it is right and legitimate that we should work and push the development of all things electrical to the utmost limit."

Power Restrictions in Southern California Removed

The restrictions on the use of electric power which have existed in southern California since June 16, because of the abnormally dry year, were officially declared off by Power Supervisor Butler on November 10. The situation had been growing less acute during the past month, and when on November 8 and 9 heavy rains fell throughout California it became possible to remove all restrictions.

The following statement relative to the situation was issued by Fred B. Lewis, assistant general manager of the Southern California Edison Company:

"In the Big Creek and San Joaquin region in the High Sierras, in which the Edison company has its largest hydro-electric plants, there was an average of three inches of rainfall in this storm. This, together with from one and one-half to two inches of rain in the Kern River region, has brought the streams up sufficiently to furnish practically full capacity to the plants. The generous rain not only removes all restrictions but also enables the company to discontinue the operation of the twelve obsolete steam plants which it has been operating at heavy expense during the period of shortage. The Long Beach steam plant, which has been built in record time, will add 20,000 kw. to the system on December 1, and this, with the increased hydro-electric output, will put the Edison system back on a normal operating basis."

Majority of Two Years Ago Exceeded

California Defeats Water and Power Act by 400,000—Vote on Bone Bill Closer, but Decisive—Hunt's Narrow Escape

OFFICIAL returns on the California referendum on the water and power act, which would have bonded the state for half a billion dollars to begin a state hydro-electric system, had not been published as the ELECTRICAL WORLD went to press, but unofficial figures indicate a majority even larger than that of two years ago, when the proposed amendment to the constitution was beaten by more than 350,000 votes. In 7,051 out of 7,465 precincts the vote stands: Against the act, 696,216; for the act, 297,620, an adverse majority of 398,596, or much better than two to one.

The bill to forbid power development on the lower Klamath River was carried (6,900 precincts out of 7,465) by 520,668 to 350,758.

In Washington the Bone bill, framed in the interest of municipal ownership and operation, was beaten, according to the unofficial tally, by 183,621 votes to 117,666, a majority of 65,955.

Governor Hunt of Arizona, standing for continued opposition to the seven-state treaty on the Colorado River, pulled through by a narrow majority—1,012 in a vote of about eighty or ninety thousand.

Arizona Defeats Proposal to Survey Colorado River

An initiated measure placed before the voters of Arizona which provided for a state appropriation of $100,000 for an investigation or survey of the Colorado River regarding irrigation and dam sites was lost by 2,300 votes.

Manufacturers Have Faith

Voice Confidence in Business Outlook at A. M. E. S. Meeting—Need of Statistics

AN EMPHATIC note of confidence in the business outlook for the electrical industry was struck by the speakers at the banquet of the Associated Manufacturers of Electrical Supplies at the Hotel Roosevelt, New York, on Wednesday evening, November 12. William H. Thornley presided.

E. M. Herr, president of the Westinghouse Electric & Manufacturing Company, analyzed the present economic situation in the country. "The American and English elections and the adoption of the Dawes plan," he said, "have created a strong confidence in commerce and industry and will stimulate business throughout the world. The electrical industry can look forward to an enduring market. It does not share the belief of some people that the United States will suffer from European rehabilitation, because inevitably with it will come a greater demand for American goods in foreign markets." Mr. Herr sketched the substantial basis of improved confidence evidenced by increases in employment, wages and per capita earnings and the rising prices of metals. Although building is less extensive, the basic industries are sound and goods on hand less than normal. He pointed out the growing stability that is coming with the increase in volume of the small electric appliance and equipment business. When money is tight the market for heavy machinery disappears, but the smaller products are not dependent upon the money market. He stressed the need for increasing co-operation between electrical manufacturers as the industry expands.

A message from James H. McGraw, president of the McGraw-Hill Company, discussing at length the need for industry statistics on the production, stocks and sales of electrical manufacturers, was presented by Earl E. Whitehorne, commercial editor of the ELECTRICAL WORLD, Mr. McGraw being absent owing to illness. In this message figures were cited to prove the wide variance between the estimates that are being made by different manufacturing executives in reckoning by guesswork the market for a given commodity. This variance is shown by the estimates that are now being annually compiled by the ELECTRICAL WORLD and *Electrical Merchandising*. The industry has suffered in consequence. Mr. McGraw offered the services of the ELECTRICAL WORLD for the gathering, compilation and publication of statistics on the manufacturing branch of the industry, in the same manner that the paper now publishes mass statistics on the light and power industry.

James E. Emery, counsel for the National Association of Manufacturers, made an eloquent address which dwelt on the way in which the experience of the last few months has shown the intimate relationship that exists between business and international conditions. "The shadows and doubts which have lain across the threshold of American business have disappeared," he said, "with the adjustment of European affairs and as the remarkable dynamo in the presidential chair at Washington has demonstrated his capacity to develop and deliver political power." He expressed strong confidence in the general industrial outlook.

S. L. Nicholson, president of the association, in a general session held on Wednesday afternoon, made a masterful analysis of the status and trend of code development and the standardization of inspection in the electrical industry.

Dr. Walter Boveri Dies

President of Noted Swiss Manufacturing Concern—Economist and Organizer of Electrical Industry

DR. WALTER BOVERI, president of the famous firm of Brown, Boveri & Company, died at his home at Baden, Switzerland, on October 28. The immediate cause of his death was a heart lesion which he suffered in September. Dr. Boveri had actually never recovered from an automobile accident which he met with in August, 1922, while on a tour in Holland.

Walter Boveri was born in Bamberg, Bavaria, in 1865, of Italian-Swiss parentage. He attended the industrial school at Nürnberg and after completing his studies there entered the services of the Oerlikon Machine Works, where he was chiefly in charge of installation work. In 1890 he left the Oerlikon works and with the elder Charles Brown, who was chief designer at Oerlikon, started the plant at Baden which has since developed to be one of the best-known electrical manufacturing concerns in the world. Associated with Mr. Brown and Dr. Boveri were Sidney Brown, the brother of Charles Brown; Mr. Bauman and Fritz Funk. Sidney Brown and Fritz Funk still survive, the latter as ranking vice-president of the company. It is a coincidence worthy of mention that Charles Brown, Mr. Bauman and Mr. Boveri all died of the same ailment—heart lesion.

DR. WALTER BOVERI

The firm was founded as a purely electrical manufacturing concern with the modest capital of 615,000 Swiss francs (about $120,000), and in the year of its twenty-fifth anniversary it had reached more than one hundred times this amount. As early as 1892 it added mechanical products to its line. During the twenty-five years of its existence it has established associated manufacturing concerns in many other countries, and its products are known all over the world.

Dr. Boveri acted as president of Brown, Boveri & Company from the inception of the company to his death. He was never a designing engineer. He was best known as an organizer and was a deep student of economics. He was primarily responsible for the creation of the associated companies which were established in Paris, Milan, Christiania, Vienna, Budapest, Rotterdam, Mannheim and Warsaw, with factories at various places in the eight countries—France, Italy, Norway, Austria, Hungary, Holland, Germany and Poland—and with affiliated sales agencies in virtually every country in the world.

Dr. Boveri was a man of charming personality and one who never knew what an obstacle was. He had a great number of friends in all the countries of Europe as well as in the United States. He was an honorary citizen of the town of Baden and a member of many electrical and scientific societies.

National Commissioners' Association Elects Ainey

The National Association of Railway and Utilities Commissioners met in annual convention at Phoenix, Ariz., from Tuesday to Friday of this week and was addressed by prominent commissioners, utility executives and officers of national societies. W. D. B. Ainey, chairman of the Public Service Commission of Pennsylvania, was elected president in succession to H. G. Taylor, chairman of the Nebraska State Railway Commission. James B. Walker of New York was re-elected secretary and John E. Benton general solicitor.

Emmons Resigns Vice-Presidency of General Electric

George E. Emmons, vice-president in charge of manufacturing of the General Electric Company, has announced his resignation. Mr. Emmons has been identified with the company and its predecessors for nearly forty years and with the Schenectady works for thirty. For twenty-five years he was manager of the works. In 1916 he was made a vice-president. He intends hereafter to make his home in Pasadena, Cal.

Southern California Budget for 1925 Is $25,000,000

Twenty-five million dollars was authorized by the directors of the Southern California Edison Company November 13 as the company's construction budget for 1925. With the steam plant at Long Beach practically completed, next year's appropriation will provide largely for hydro-electric development. The new budget provides for the following major items: Hydro-electric development on the Big Creek-San Joaquin projects, $7,535,000; completion of steam plants now under construction, $3,965,000; increasing 220-kv. transmission facilities, $1,500,000; ex-

tension of distribution system and betterments, $12,000,000.

The expenditures of the company for 1924 and 1925 will aggregate $55,000,000 and make a repetition of the power shortage impossible.

Hydraulic Committee

Lays Plans for Co-operative Work in Many Directions—Parallel Meetings Proposed

ELEVEN members of the N. E. L. A. hydraulic power committee were present at its recent meeting in St. Louis, and seven geographic divisions were represented. In line with the general spirit of the group meetings of the Technical Section, it gave extensive consideration to methods of co-ordinating national, divisional and local committee work. In addition, definite plans were laid for work to be done by individual committee members, as well as through co-operation of divisional committees along the following lines: (1) Survey of hydraulic plant layout; (2) mechanical reliability of water-power units and plants; (3) investigation of pitting of waterwheels; (4) investigation of fish ladders; (5) experience with different types of dams; (6) results of draft-tube tests; (7) keeping and interpreting operating records; (8) forecasting water supply; (9) bibliography of hydro-electric literature.

Among subjects suggested for future consideration were the following: (1) Handling ice problems; (2) handling trash; (3) water hammer and surge tanks; (4) speed regulation; (5) relative fields of different types of waterwheels; (6) progress reports on economies of back-water suppressor; (7) vibration of waterwheels; (8) settling basins and silt; (9) recapitulation of hydraulic studies made by other societies. Opinion was expressed that geographic division hydraulic committees should be asked to watch for regulations affecting utility hydro-electric development, operation, testing, etc., and to report these to the national committee. The advisability of specifying methods of testing hydraulic units was also brought out. The suggestion of hydraulic equipment manufacturers that the committee devote a session or part of a session to the discussion of operating problems with the manufacturers' representatives was favored, but it was considered desirable to ascertain the N. E. L. A. policy on this procedure first.

WAYS OF PROCEDURE

At least a dozen specific ways of co-ordinating the work of the national, divisional and local committees were discussed. It was agreed that the committee studies will hereafter be made through the division committees rather than by having national committee members take up the subject with individual companies, except in a few cases where the latter course may be preferable. Where any division initiates a study to be made nationally or in other divisions as well, that division will be selected as sponsor for the broader study, other divisions being urged by the national committee to co-operate with the sponsor division. It is planned to acquaint all geographic division hydraulic power committees with the national committee's program and reciprocation is invited. Every geographic division hydraulic power committee is urged to appoint a representative to the national committee in order to assure co-ordination of work. Serial reports are favored and urged instead of voluminous reports at the end of the year. To permit the holding of more representative meetings it was suggested that the committee have a vice-chairman as well as a chairman, the two to be appointed from opposite sections of the country, and that parallel meetings be held.

A motion was passed that the Pacific Coast Electrical Association be made sponsor for a national survey on the layout of hydro-electric plants, with a request that it render reports serially. A study of the mechanical reliability of water-power units having been started by the Pennsylvania Electrical Association, that association was requested to act as sponsor for the national survey, working through the divisional committees of the N. E. L. A. A supplementary report on pitting of waterwheels by Albion Davis, containing more experience from operating companies and manufacturers, will be presented as a serial report in a month or two. It was suggested that laboratory tests be encouraged to ascertain the cause of pitting.

W. W. Tefft was made sponsor for a national survey of operating experiences with dams, and the New England Division was asked to sponsor a progress report on tests of different types of draft tubes, pointing out the effect on vibration of breaking the water column. J. S. Riddle was requested to carry on again this year the study of testing facilities for hydro-electric plants, keeping records and interpretations thereof. John B. Fisken expects to present a report on forecasting water supply.

Other subjects were discussed in a "round-table manner," for example, principles in control of waterwheel-gate mechanisms, determination of the effect of earth temperature on ice formation, temperature effect from low draw-down on irrigation ponds, planting of minnows in ponds to prevent mosquito pests and handling of ice problems.

Skagit and Susquehanna Projects Up

Seattle Seeks Federal Permit for New Municipal Development—Conowingo Undertaking Ready for License—Other Applications Before Commission

THE city of Seattle has filed with the Federal Power Commission an application for a preliminary permit covering its proposed new 300,000-hp. municipal development on Skagit River. The permit states that the dam is to be 400 ft. high and 1,000 ft. long. At the base, however, the length of the dam will be only 50 ft. The site that is selected for the structure is one mile below Ruby Creek. This will create a reservoir of 1,000,000 acre-feet capacity. It is proposed further to divert Thunder Creek into the reservoir. The pressure tunnel will be 3¼ miles long. The power house will be near the mouth of Stettatle Creek. A portion of the waters of that stream will be used.

The Susquehanna Power Company has applied to the commission for a license covering its 300,000-hp. development on the Susquehanna River near Conowingo, Md. The application for a license includes as a part of the project the transmission line from Conowingo to Philadelphia. The company intends to erect a dam 90 ft. high and 4,400 ft. long. This will create a reservoir with a capacity of 12,500,000,000 cu. ft. The tailrace is being excavated to tidewater level. The hydraulic features of this important project have been under contemplation for more than sixty years. The work done by the Susquehanna Power Company under its preliminary permit during the past two years is said to show conclusively the feasibility of the development.

An application for a permit to build a large dam on the New River which would divert the south fork of that river into the Reddies River for purpose of extensive power development has been amended by the Central Power Company of Albemarle, N. C., so as to exclude that part of the project lying within Virginia. The proposed dam would change an entire river from the Gulf drainage area of the Blue Ridge to the Atlantic drainage area and would, it is said, make possible the development of three new projects on the Reddies and increase the possibilities already existing on the Yadkin River. The application covers diversion dams and power projects in Wilkes, Ashe and Alleghany Counties, N. C.

The Kentucky-Tennessee Light & Power Company, following a survey by Stone & Webster, has applied to the Federal Power Commission for a preliminary permit covering power projects at Government Dam No. 1 on the Barren River and at Dams Nos. 4, 5 and 6 on Green River.

Street-Lighting Tables for 1925

FOLLOWING its practice for thirty-six consecutive years, the ELECTRICAL WORLD has prepared tables showing the proper time for lighting and extinguishing street lamps. These tables for 1925 are now ready, and a copy of them will be sent free to any subscriber upon request to ELECTRICAL WORLD, Tenth Avenue and Thirty-sixth Street, New York. For more than one copy a charge of 25 cents each is made to cover a portion of the postage, printing and compilation costs.

The Kern River water-storage district has applied for a preliminary permit covering a power project on the Kern River in California. It is proposed to regulate the flow by the erection of a concrete gravity-section dam 150 ft. high and 1,500 ft. long. The dam site is near Isabella at a point in the canyon where diversion can be made also for irrigation purposes.

A protest has been filed with the Federal Power Commission by the Tennessee-Carolina Power Company against the granting of a preliminary permit to the Thompson Power Company covering a project on the Hiawassee River. It is contended that that company will not be able to obtain the necessary state rights for its development, since some of these rights already have been granted to the Tennessee-Carolina company.

Washington-Idaho Properties Are Bought In

The properties of the Washington-Idaho Water, Light & Power Company have been bought in at auction sale by L. B. Hatch of New York, representing the holders of the company's bonds and notes. At Chehalis, Wash., on November 8 the western properties of the company were bid in at $100,000. At Lewiston, Idaho, November 10, the eastern properties brought $125,000. The sale, which, as announced previously, was ordered by the United States court, has not yet been confirmed by it. It is stated that the properties will be operated eventually by the interests controlling the Pacific Power & Light Company of Portland, Ore.

Outlook Good for Private Hydro Plants in Maine

Development of Maine's water-power resources by private capital has been strengthened by the recent elections, and agitation for state participation in this field has greatly diminished during the present year. Water-power issues cut little figure in the 1924 gubernatorial campaign, and the report of the power investigating committee of the Associated Industries of Massachusetts as to the extent of Maine's resources and the relatively high cost of transmitting this power into other parts of New England has had the effect of quieting agitation against power exportation.

There is still a strong undercurrent of popular opposition to the exportation of hydro-electric energy generated in Maine. At present the public utilities are largely obliged to supplement their water-power resources with steam-generated energy, and there seems to be no great demand for Maine water power in either New Hampshire or Massachusetts. In public utility circles the question of power exportation is at present regarded as somewhat academic. It is possible that at the next session of the Legislature the old issue of state development of reservoirs may again come to the front, and sooner or later the participation of Maine in superpower development in the Northeast will have to be determined.

Florida Properties Bought by American Power & Light

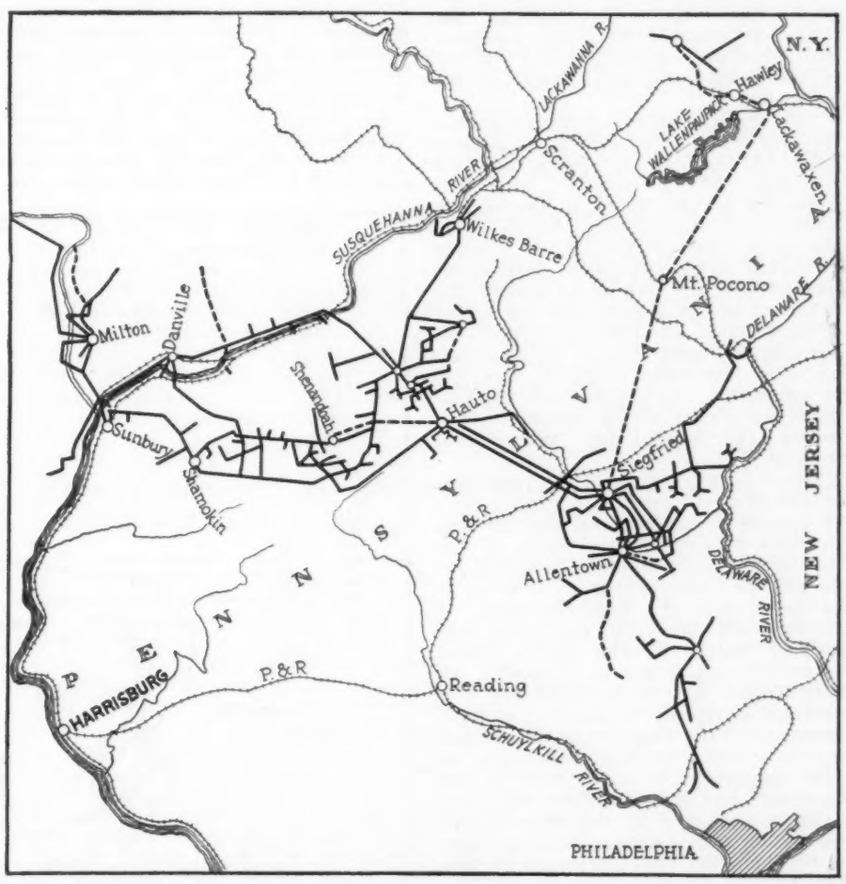
The American Power & Light Company announces the purchase in its interests of the Miami (Fla.) Electric Light & Power Company, the Miami Water Company and the Daytona (Fla.) Public Service Company. Earlier in the year the electric power and light and electric railway properties in Miami Beach were bought in the same interests, and more recently the American Power & Light Company has obtained control of the Southern Utilities Company through the exchange of its preferred stock for the common stock of the latter.

Including the companies recently purchased, the American Power & Light Company will control companies operating in thirty cities and towns in Florida and having present annual gross earnings of approximately $5,500,000. Electric power and light service is supplied to all of the communities with the exception of two. Among the most important cities served with one or more classes of service are Miami, Miami Beach, Palm Beach, West Palm Beach, Daytona, St. Augustine, Sanford, Arcadia, Fort Myers and Palatka.

Private Bid for the Norwich (Conn.) Municipal Plant

An offer expiring November 15 for the purchase of the Norwich (Conn.) municipal lighting plant has been received by James L. Case, chairman of the city Board of Gas and Electrical Commissioners, from Bodell & Company, Providence, R. I. Those making the offer agree to pay $2,250,000 in cash if the city authorities so elect in the acquisition of the property. The ELECTRICAL WORLD is informed by Bodell & Company that the name of the principal and other details of the offer cannot be made public at this time.

Pennsylvania to Have First 220-Kv. Line in East



THE Phoenix Utility Company, which is in charge of the construction work of the Wallenpaupack Creek hydro-electric development of the Pennsylvania Power & Light Company, has recently placed an order for structural steel for the transmission line from Hawley, Pa., the site of the Wallenpaupack hydro-electric station, to the Siegfried receiving substation, a distance of almost 60 miles. This line will operate at 220,000 volts and will be the first line of that voltage east of the Pacific Coast. Details of the design of the towers are not yet available. The order for the steel work, which was placed with the Lehigh Valley Structural Steel Company, is for approximately 2,000 tons. It will be recalled that the hydro-electric plant at Hawley will have an initial installed generating capacity of 40,000 kw. A reservoir of 12 miles in length, covering 5,600 acres, will be created for storage, through the building of an earth-filled concrete dam, 60 ft. high and 1,150 ft. in length.

Robinson Law May Now Be Workable

Election Makes It Likely that New York Will Grant Permits for Use of State Power Sites

ONE important result of the election in New York State last week is the partial clarification of the situation in relation to development of state-owned water power. In 1921 and 1922 the Robinson water-power law was enacted under the administration of Governor Miller. This law in brief allowed the issuance of permits for development of state-owned water power to private corporations at such rental as might be fixed by the Water Power Commission and conferred upon the Public Service Commission authority to fix rates to be charged the public for electricity generated. It provided, however, that whenever any surplus waters of the Barge Canal are used for such development, the plans shall be subject to approval of the Superintendent of Public Works. The Water Power Commission it set up consists of the Conservation Commissioner, the Attorney-General, the State Engineer and Surveyor, the Temporary President of the Senate and the Speaker of the Assembly.

The commission was impeded during its first year of existence by certain defects in the law which were remedied in 1922. At the election held that year the people voted a Democratic administration into office which made the personnel of the Water Power Commission of that political complexion. The Legislature refused to modify the Robinson law in accord with the policy of the Smith administration and the commission was obliged to function under a law with which it was not in sympathy. As a result all applications for power development pending before the commission were sidetracked.

After January 1, 1925, the personnel of the Water Power Commission will be completely Republican and able to function under the provisions of the Robinson law, the only handicap to its policies being that it must work in harmony with the Superintendent of Public Works whenever the use of any surplus waters of the Barge Canal is under consideration. However, as pointed out last week, while the Republican party has a majority in both branches of the Legislature, it has not the two-thirds majority necessary to pass legislation over the veto of the Governor, and it is therefore extremely unlikely that any of the water-power legislation providing for state development along the lines suggested in 1924 will prevail.

Western Engineers Hear Pleas for Regulated Monopolies

Arguments in favor of regulated monopolies were presented by Walter A. Shaw before a meeting of the Western Society of Engineers at Chicago on November 3. Speaking from years of experience as a member of the Illinois Commerce Commission and later as a prominent consulting engineer, Mr. Shaw traced the development of utilities and declared: "The theory of state regulatory bodies to handle all public utility matters, state-wide, is sound and opens the door, if wisely administered, to the greatest possible development of our public utilities. The need today is for business organizations to interest themselves in these problems by causing a sound and scientific study and investigation of the whole subject to be made with the idea of correcting abuses, making laws more practicable and profiting by past mistakes."

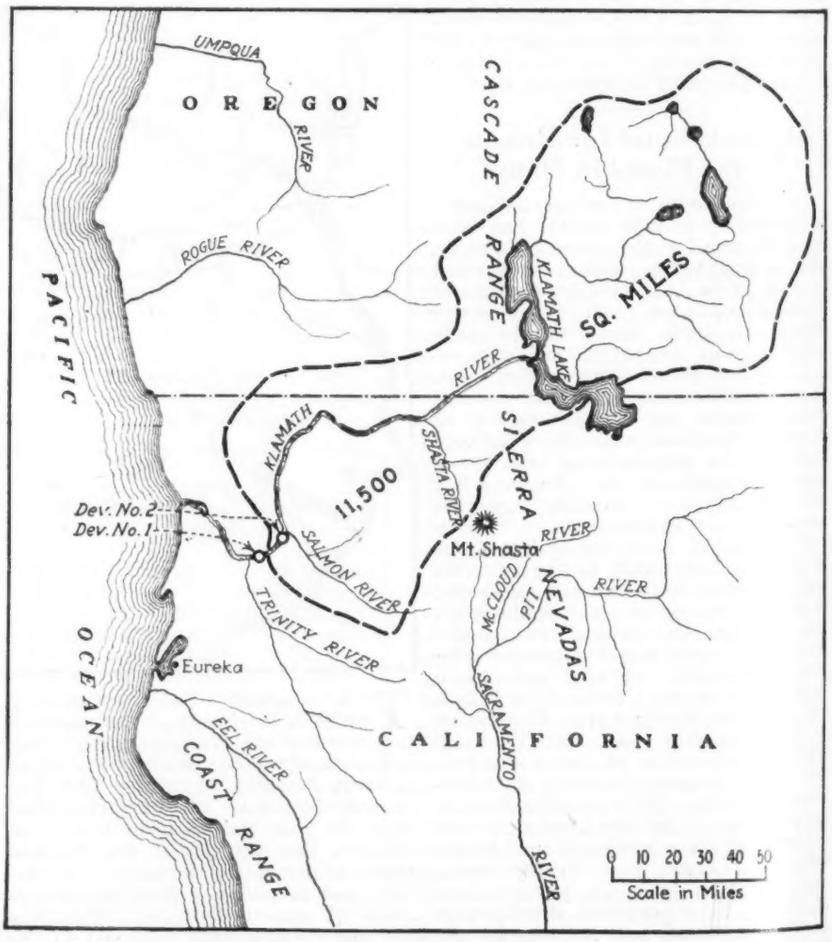
Bert H. Peck, Illinois Power & Light Company, St. Louis, expressed the view that past experience has shown the state regulation of monopolies to be far more efficient and trustworthy than where home city rule governs the utilities.

Superpower as affected by state regulation was discussed by R. F. Schuchardt, Commonwealth Edison Company, who explained that superpower was merely a natural growth in the supply of energy under economic engineering principles. By proper coordination between properties, together with sane and human regulation, the public was best served with a commodity at a lower price than would be possible where no regulation existed.

Water-Power Development on Lower Klamath River Prevented for All Time

THE efforts of the California Fish and Game Commission to prevent the development of hydro-electric power on the Lower Klamath River in northern California met with success when at the election last week the voters of the state passed an initiated measure designed to protect the salmon-fishing industry by preventing forever any power development on the river from the mouth of the Shasta River to the sea. This includes all of the undeveloped and unappropriated water-power projects on the Klamath River in California for a distance of 175 miles. The course of the river is shown in the map below. The power resources that have been rendered useless aggregate approximately 500,000 hp.

As already explained in the ELECTRICAL WORLD, the bill was initiated because of the proposed development of 100,000 kw. on the lower river by the Electrometals Company of San Francisco for the extablishment of electrochemical and electrometallurgical industries. The company had secured water rights from the state Division of Water Rights and conditional preliminary permits from the Federal



AREA WATERED BY KLAMATH RIVER IN CALIFORNIA

Power Commission. The commission took the view that protection of the fish was vitally important, but that means could be found to save the fish and at the same time permit development of this important power resource.

In commenting on the results of the election W. G. Devereux, president of the Electrometals Company, said: "The future is very obscure, and it is difficult to say what will be done by my company."

Colonel Kelly on Fish Problem in Power Development

In commenting on the proposal to withdraw the Klamath River from power development and on the experiments being made to get fish over high dams in Washington, Colonel William Kelly, chief engineer of the Federal Power Commission, said recently while on the Pacific Coast:

"I have just inspected the power possibilities of the Klamath River in California. The Klamath has a very large stream flow, a great number of good dam sites, and the fact that the river falls more than 4,000 ft. makes it an exceptionally fine stream for power development. More than 3,000 ft., or 75 per cent of the total fall, can be efficiently utilized. On the Lower Klamath the power sites near tidewater constitute the only ones in the United States of such large size and excellent quality so situated. Preliminary permits for the development of about 15 per cent of the available power already have been granted.

"Just before coming to California, I visited Seattle and investigated the experiments in progress on a tributary of the Columbia River to take fish over high dams, under the direction of Dr. John N. Cobb, dean of the College of Fisheries of the University of Washington, in co-operation with the Federal Bureau of Fisheries and the State Fish Commissions of Oregon and Washington. These experiments included the trapping of salmon and raising them high enough to pass them over a dam about 125 ft. high by a mechanical fishway, which in reality is a power-operated elevator constructed by the experimenting committee. I am convinced that by this method fish can be taken over any dam regardless of height without injury to the fish.

"The Federal Power Commission in granting preliminary permits for development of power on the Klamath River made a special provision that the development could not be undertaken unless the migration and culture of fish were maintained under existing conditions. The industries which would result from the development as planned would add enormously to the wealth of northwestern California and benefit the country as a whole."

Complaints from California were filed with the President to the effect that Colonel Kelly had visited the state prior to the election to work against the Klamath River measure. Colonel Kelly makes it clear, however, that he was in no way active in this connection politically, but only as an engineer fulfilling his duties to the Federal Power Commission, and says that there is nothing to justify the complaints.

Terms of Proposed Contract at Holyoke, Mass.

Terms of the proposed contract between the Turners Falls Power & Electric Company and the Holyoke (Mass.) Street Railway Company have been made public. Under the terms of the agreement made by the street-railway management with the power company and accepted by the railway board of directors, the railway will sell its power plant to the Turners Falls company for $400,000, and in consideration of this the railway company agrees to take and the power company to furnish electrical energy, under terms fully set forth, for a period from June 1, 1926, to December 31, 1945, and thereafter unless terminated by at least two years' notice given by either party to the other. It is agreed, moreover, that the power company may begin to furnish power to the railway company before June 1, 1926, if it can prepare itself to give the service.

Energy is already being delivered by the power company to the railway company from substations in Chicopee, Amherst and Easthampton. The power company contracts to use every means in its power to secure the easements, rights-of-way, franchises, locations and other rights necessary to carry out the arrangement, and failing in this the agreement becomes void. The price at which the railway company agrees to sell its power plant in Holyoke to the Turners Falls company is $138,880 less than the amount at which it is assessed by the city. In explanation of this L. D. Pellissier, president of the railway company, says that the assessed valuation does not take account of depreciation during the last few years. The stockholders of the railway company will vote November 18 on the proposal.

More About Rural Electrical Progress in Wisconsin

Farmers, public utility executives and engineering students—among the latter representatives of Iceland, China and Japan—met at Ripon, Wis., on October 29 to listen to the first formal report on the progress of the farm-electrification experiment which is being conducted about a mile south of Ripon under the auspices of the College of Agriculture. Prof. F. W. Duffee and E. R. Meacham of Wisconsin University, who are directing the experiments, asserted that the farmers are enthusiastic over the possibilities. On six farms experiments are being conducted with electric hay hoists, feed-grinding machines, grain and hay driers, cook stoves, water pumping, milking, dishwashing, clothes washing, ironing, chicken breeding and pea-vining. Miss Wealthy Hale of the home economics extension division of the University of Wisconsin is instructing the wives of farmers in the use of electricity for cooking and baking.

Professor Duffee said that next year experiments with a combined harvester will be made and that the drying of hay and grain by artificial means will be gone into more thoroughly. He plans to load grain bundles directly from the harvester to the wagon by means of an elevator, stack immediately and start the drying at once. If the experiment is satisfactory, it should save farmers much time and labor, he said, and produce a better quality of grain. Herman Ihde, master of the State Grange, said: "It looks to me as if electricity will put a 'kick' into the efficiency of farm machinery and make agricultural work more interesting." Dr. E. A. White, director of the national committee on the application of electricity to agriculture, prophesied that when the rural-service problem shall have been solved "farming will be revolutionized and electric companies will have their best customers awaiting them."

Wisconsin Operators Discuss Merchandising Methods

With an address on the place of the commercial department in the public utility field John St. John, vice-president Madison Gas & Electric Company, opened a well-attended meeting of the Commercial Section of the Wisconsin Utilities Association at the Hotel Loraine, Madison, November 7. He was in favor of a cordial relationship with local electrical contractors and appliance sellers and said the first requisite lies in the choice of a manager thoroughly "sold" on the idea that his department should operate profitably. Then salesmen must be employed who can creditably represent the company. Allowing employees a liberal discount on appliances is one effective way, Mr. St. John declared, to push their sale to others.

R. J. Walter, Southern Wisconsin Power Company, Madison, felt that, with the standard of living for the average American far above that in other nations, it is merely a case of showing how a given appliance will raise that standard a little higher. Service, according to Mr. Walter, should be the main talking point and not cost. I. F. Wordendike, Janesville, did not think that unprofitable merchandising departments should be considered failures. The added revenue through the sale of more energy should, at least in part, be credited to the merchandising departments.

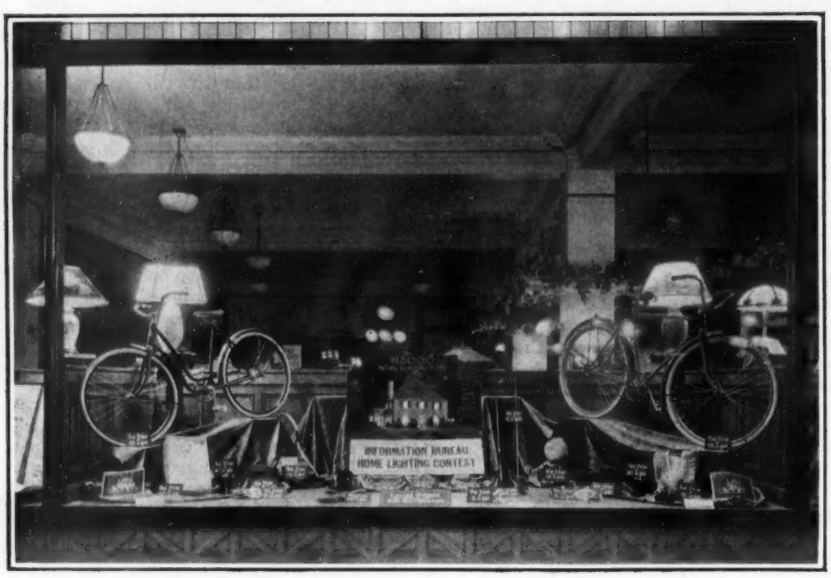
The benefits of stock selling in improving the salesmanship of employees were dwelt upon by John G. Learned, vice-president Public Service Company of Northern Illinois. Here, he said, is the greatest chance of all utility history to train employees to become better salesmen. Mrs. Catherine Delaney, Wisconsin Public Service Corporation, Green Bay, told how she had developed her home service department, which has for its aim the teaching of housewives the use of labor-saving devices. Co-operation between manufacturers and utility merchandising managers, especially in the use of sales promotional campaigns, was urged by J. H. Fagan, Milwaukee.

At the banquet in the evening Dr. Paul W. Ivey, professor of marketing, University of Nebraska, gave an excellent presentation of the fundamentals of effective salesmanship.

How Teachers Are Helping

Campaign for Better Home Lighting Reaches Omaha's "Little Italy"—Strong Effort in New Jersey

THE wide scope of the home-lighting contest is illustrated in a report received by the Lighting Educational Committee from K. P. Goewey, in charge of the activity at Omaha, which says that much enthusiasm is manifested in the "Little Italy" of that city. In one of the public schools, in a district peopled almost entirely by Italians, only about 25 per cent of the children have electricity in their homes, and the teacher of the sixth grade took the entire class to a wired home and helped them fill out their investigation and report blank in the primer. This is a typical example of the co-operation extended by teachers throughout the country. Definite reports have been received from more than five hundred towns that school indorsement has been obtained. New Jersey alone has 115 communities where school authorities have approved the contest.



SHOW WINDOW ARRANGED TO AROUSE CHILDREN'S INTEREST IN CAMPAIGN

The Public Service Electric & Gas Company of New Jersey is making a vigorous campaign. So far 150,000 registration cards, 150,000 announcement folders, 53,000 pins and 60,000 primers have been distributed in the territory covered by this company. Twenty-two model homes have been opened in various localities and the lighting and the furnishings in these homes have all been installed under the supervision of a lighting expert and decorator. On the streets leading to the model homes arrow signs have been posted carrying the words "To Better-Lighted Home." In addition to this, all of the model homes are floodlighted at night. These homes are visited by about six thousand people per day. The prizes for the various cities are displayed in the local showrooms of the company and are an effective means of additional publicity. The illustration shows a show window arranged to appeal to the school children.

Briefer News

Commercial Section, N. E. L. A., Meetings to Be Held in San Rafael, Cal.—The conference and meetings of the Commercial Section, N. E. L. A., national committees, originally announced to be held next week in San Francisco, will be held instead in San Rafael, a few miles north. The meetings will follow the schedule published in these columns on October 11, page 811.

Wisconsin Tax Commission Discriminates Against Utilities.—Vigorous protest is being made by the public utility companies in Wisconsin through the Wisconsin Utilities Association against the Wisconsin Tax Commission's new valuation policy toward them, which is on a basis of 100 per cent of their present value regardless of the percentage used by local assessors in valuing other private property. General property is assessed at only 80 per cent, and the association protests that to assess utility property at full value is therefore unjust and discriminatory.

Blue Laws Invoked Against Kentucky Company.—H. B. Kinsolving, Commonwealth's Attorney, Anderson County, Lawrenceburg, Ky., has filed suit in the Anderson Circuit Court against the Kentucky Hydro-Electric Company, asking that a fine of $900 be assessed against the company for violation of the Sabbath working laws, in that the company on June 19 had a crew of eighteen men erecting steel towers in Anderson County. Under the old law there is a penalty of from $2 to $50 for violation, and the officer of the law is endeavoring to have the maximum fine imposed for each workman. It is said to be the first action ever taken in Anderson County under the law, which has been a dead letter.

Rural Extension Plan of Rochester (N. Y.) Company. — According to Thomas Yawger, superintendent of the electric department, the Rochester (N. Y.) Gas & Electric Corporation's transmission lines in Monroe County have been extended to more than 75 miles of highway within the last year. Many of the new rural lines have been financed by a plan originated in Rochester, in which the company allows 200 ft. of line to each consumer served, the extra mileage being financed by the consumers. This advance is refunded to the underwriters of the line when additional consumers bring the number up to one for every 200 ft. of wiring.

Shawinigan Company to Develop the Batiscan River.—A 20,000-hp. development on the Batiscan River, in the Province of Quebec, is projected by the Shawinigan Water & Power Company. A small hydro-electric plant now existing on this river — one of the oldest electric power plants in Canada—is owned by the North Shore Power Company, a subsidiary of the Shawinigan company. A tunnel nearly three-quarters of a mile long is to extend from the new dam to the Chute des Chéminées, about 3,500 ft. below, where the power plant will be built. Connections will be made with the Shawinigan company's transmission line to Quebec City.

Canadian Government Replies to Washington on St. Lawrence Problem.—The Canadian government has forwarded to Washington a reply to the latest note of the United States administration on the projected inquiry into the St. Lawrence River waterway. The text of the Canadian reply has not been made public, but it is understood that the communication is not final and that on the particular points at issue there is a suggestion of time for further consideration by the advisory committees. Now that the American elections are over, it is anticipated in Canada that preliminaries leading up to an agreement on the character and scope of the investigation will soon be concluded.

Progress on Baker River Transmission System.—Recent completion by Stone & Webster of the 110,000-volt transmission line from Everett to Sedro-Woolley, Wash., a distance of 45 miles, marks a step in the completion of the Baker River development of the Puget Sound Power & Light Company of Seattle. The line has been put into service temporarily at 60,000 volts to improve conditions in the district, and work on the 25-mile section of 60,000-volt line from Sedro-Woolley north to Bellingham has been started. These two lines, radiating from the new Sedro-Woolley substation, will be connected to the Baker River plant near Concrete by a 110,000-volt line to be built next year.

Kentucky - Tennessee System Will Make Electric Service in West End of State Equal to Service in East.—The Kentucky-Tennessee Light & Power Company has added the Huntingdon (Tenn.) municipal plant to its growing system and is negotiating for many others. It is enlarging its plant at

Martin and building transmission lines from there to many towns, and the statement is put forth that western Tennessee will soon have electric light and power service equal to any in the state and one which will give industries the same advantages now afforded in east Tennessee.

Ready to Go Ahead with Chattahoochee Plant.—The directors of the Columbus (Ga.) Electric & Power Company have authorized the construction of a hydro-electric plant of 40,000 hp. initial capacity at Bartlett's Ferry on the Chattahoochee River, at an initial cost of $7,300,000. This is 10,000 hp. more than was originally planned. An expenditure of $500,000 has also been sanctioned for the construction of a 35-mile transmission line from Bartlett's Ferry to Manchester, Ga., there connecting with a line from Macon and facilitating the interchange of energy. As a result of the Bartlett's Ferry development the river flow will be better regulated and about 12,000 hp. at the Goat Rock hydro-electric station converted from secondary to primary power. The ultimate capacity of the Bartlett's Ferry development is estimated at a minimum of 80,000 hp.

Public Service Electric & Gas Company to Absorb Seven Small New Jersey Plants.—Supplementing the recent merger of the Public Service Electric Company, the Public Service Gas Company and the United Electric Company of New Jersey into the Public Service Electric & Gas Company, application has been made to the State Board of Public Utility Commissioners for permission to amalgamate into the newly formed company seven relatively small additional companies, five of which supply electricity. These are the Burlington Electric Light & Power, Citizens' Electric Light, Heat & Power, Middlesex Electric Light & Power, Morristown Gas Light, Nichols Electric Light & Power of Nutley, Princeton Light, Heat & Power and the Weehawken Contracting Company. Nearly all the capital stock of the foregoing companies is owned by the Public Service Corporation of New Jersey.

Survey for Pigeon River Plant Under Way.—Engineers have begun a survey of the territory near the head of the Big Pigeon River in east Tennessee, where a preliminary permit was granted early this year by the Federal Power Board to the Pigeon River Power Company of Waynesville, N. C., and where the estimated power is 60,000 hp. According to present plans the plant when constructed will be the largest of its kind in that section. Approximately three years will be required to complete the project and the cost has been put high in the millions. The main dam will be 170 ft. high and will be sufficient to impound the water in a lake with a shore line of 8 miles. Besides this dam, a tunnel 3 miles in length will be cut under the mountain near the waterfall. It is planned to distribute the power generated over the entire territory between Knoxville, Tenn., and Asheville, N. C.

San Antonio Company Buys Gonzales Plant.—Purchase of the electric light and power plant and the waterworks plant of the Gonzales Electric Light Company and the Gonzales Water Power Company, both of which were owned by Joe S. Lewis of Gonzales, has just been made by the Texas Central Power Company of San Antonio, a subsidiary of the Central Power & Light Company of St. Louis, the consideration being $500,000. It is announced that improvements and extensions to the electric power system will be made. The Central Power & Light Company owns public utility plants in a number of towns in south Texas.

Water-Heating Service for $2 a Month.—Reduction of the Idaho Power Company's minimum monthly charge for water-heating service from $3.50 to $2 for 1 kw. has recently been ordered by the Idaho Public Utilities Commission. The commission's desire to provide consumers with an incentive to use energy more economically is given as the reason for this reduction. The commission also has directed the Idaho Power Company to furnish comprehensive and detailed data regarding its retirement reserve. It will be recalled that some weeks ago the company filed in the local federal district court a bill in equity for the purpose of obtaining a review of all rate and valuation proceedings had before the commission.

Citizens' Associations Propose Compromise at Potomac Company Rate Hearing.—A hearing was held last week by the Public Utilities Commission of the District of Columbia in the long-drawn-out valuation and rate case of the Potomac Electric Power Company. An unexpected happening was the proposal of the representative of the Federation of Citizens' Associations that the company immediately lower its rates and cease to impound the difference between the 10 cents per kilowatt-hour it collects and the 7.67-cent rate ordered by the commission and now in litigation, the contestants to agree in their turn to a compromise on the valuation. The hearing was postponed, and when it is resumed the recommendation will be publicly considered. William F. Ham, president of the company, has, however, declared that an 8-cent rate is "out of the question," and the commission is understood to be determined not to concede anything above this figure.

Coming Meetings of Electrical and Allied Societies

[A complete directory of electrical associations is published in the first issue of each volume. See July 5 issue, page 50, for latest list.]

Electrical Supply Jobbers' Association—Hotel Cleveland, Cleveland, Nov. 19-21. Franklin Overbagh, 411 South Clinton Street, Chicago.

Georgia Electrical Association—East Lake Country Club, Atlanta, Nov. 26. W. W. Barr, Georgia Railway & Power Company, Atlanta.

American Society of Refrigerating Engineers—New York, Dec. 1-3. W. H. Ross, 35 Warren St., New York.

American Society of Mechanical Engineers—New York, Dec. 1-4. C. W. Rice, 29 West 39th St., New York.

Empire State Gas & Electric Association, Electric Division — Syracuse, Dec. 4-5. C. H. B. Chapin, Grand Central Terminal, New York.

Western Association of Electrical Inspectors — Brown Hotel, Louisville, Ky., Jan. 27-29. G. M. Miller, 1304 South Seventh St., Louisville.

Wisconsin State Association of Electrical Contractors and Dealers—Pfister Hotel, Milwaukee, Jan. 28-30. H. M. Northrup, 23 Erie St., Milwaukee.

Three Iowa Companies Unite.—Waterloo, Iowa, will be headquarters for the Central Iowa Power & Light Company, just formed by the consolidation of the Citizens' Gas & Electric Company of Waterloo and Cedar Falls and the Cedar Valley Electric Company of Charles City, Hampton and surrounding territory with the Northern Iowa Gas & Electric Company. The new company will operate in eighteen counties. Interconnection of the various hydro-electric and steam generating stations is contemplated. Besides the cities just named, Eagle Grove, Clarion and Humboldt are among the places to be supplied. The total population reached is estimated at 200,000. The company will, besides, supply electrical energy to the Northeastern Iowa Power Company at Sumner, serving a population of 100,000. It hopes ultimately to have eight hydro-electric plants, four main steam generating stations and four auxiliary generating stations, having a total capacity of 26,320 kw. Hydro-electric plants now exist at Humboldt, Rutland, Charles City and Nashua, and there are undeveloped water-power sites at Waterloo, Cedar Falls, Janesville and Floyd. The principal steam stations are at Waterloo, Charles City, Eagle Grove and Spirit Lake.

Cheap Power for Yakima Valley.—The Intermountain Construction & Electric Company, in a proposition presented to the City Commissioners of Yakima, Wash., asserts that power and light at one-third the present cost can be furnished the city and Yakima Valley if the company, whose headquarters are in Seattle, receives support. The company plans to build a power plant of three units at Glade Canyon to develop 130,000 hp., enough, it is said, to supply the entire Yakima Valley with cheap light and power. The power system would be really a by-product of the company's irrigation project, which involves the irrigation of 300,000 acres of Horseheaven land, with canals leading off from Glade Canyon, below the proposed power plants. The surveys are completed, and the company has clear title to the water rights required, the commission has been informed. The intake for the main canal will be near the base of Mount Adams, 120 miles above Glade Canyon. The City Commissioners were told that power could be laid down at the city limits of Yakima at ½ cent per kilowatt-hour, which could be retailed at 1 cent for power purposes and 5 cents for household use. Financing of the project would be through the sale of irrigated land bonds, it is stated.

Men of the Industry

F. G. Hamilton Receives Promotion

F. G. Hamilton, general superintendent of distribution of the Southern California Edison Company, was recently promoted to that position, having been division superintendent of distribution of the Mount Whitney district of the company. He entered the employ of the Mount Whitney Power Company in 1899, and after working in various capacities was made division superintendent in charge of construction and operation, later becoming superintendent of distribution and purchasing agent. At the time of the consolidation of that company with the Southern California Edison Company in 1917 he was general superintendent of the Western Division of the Mount Whitney company, and from then up to the present time he has been division superintendent of distribution.

F. G. HAMILTON

Roland L. Grissom, formerly local manager of the Laredo (Tex.) Electric & Railway Company, has been placed in charge of the light and power plant at Natchez, Miss., recently taken over by the Southern Light & Power Company.

A. M. Grall, new-business manager of the Warren division of the Ohio Public Service Company for the past four and one-half years, has been transferred to the newly formed Sandusky division in the same capacity. This division was formed from the acquisition of the Sandusky Gas & Electric Company by the Public Service Company.

C. E. Dove of Vincennes, Ind., has been appointed general manager of the Dubuque Electric Company by the Utilities Power & Light Corporation, which has recently purchased the former company. Mr. Dove will succeed T. T. Parker in this capacity and will assume his position late in November. He is a man of wide experience in the light and power industry, having been for the past six years manager of the Indiana Power Company, which was until recently a property of the Utilities Power & Light Corporation.

Ross B. Mateer, past-chairman of the Philadelphia Section of the American Institute of Electrical Engineers, has recently been appointed executive secretary of the Middle Eastern Geographical District of that body. Mr. Mateer was for a number of years associated with the engineering and commercial development of light and power service companies on the Pacific Coast. Since 1918 he has been associated with Pennsylvania utilities.

Philip G. Gossler, president of the Columbia Gas & Electric Company, sailed for Europe on the *Majestic,* Saturday, November 8. While Mr. Gossler's trip was planned as a brief vacation, he intends to take advantage of his stay in Europe to study certain industrial conditions.

Raymond E. Shaw has been appointed general sales manager of the B. F. Sturtevant Company, Hyde Park, Mass. He was manager of the New England office of the company with headquarters at Boston from 1921 to the fall of this year and for three years previously was Western manager of the company with offices at Chicago.

S. J. Roberts, formerly new-business manager of the Alliance division of the Ohio Public Service Company, has been transferred to Warren in the same capacity to succeed A. M. Grall, who recently joined the Sandusky division. Previous to his connection at Alliance, Mr. Roberts was associated with the Doherty interests elsewhere—at Bartlesville, Okla., and Lorain, Ohio.

Joseph Lappin, formerly in charge of the Detroit office of the Combustion Engineering Corporation, has been assigned to that organization's New York office, where he will engage in special work.

A. P. McDonald, who has for the past two years been in charge of the electric light plant at Hibbing, Minn., has resigned, as of December 1, to become superintendent of the property of the Minnesota Northern Power Company at Bemidji, Minn.

N. P. Farrar has been appointed assistant sales manager of the Pawling & Harnischfeger Company, Milwaukee, having previously been district manager of the Philadelphia territory.

Glenn D. Evans, who was for many years connected with the J. F. Buhr Machine Tool Company, has again joined this organization in the capacity of chief engineer. During the past three years Mr. Evans has been chief engineer of the Climax Engineering Company of Los Angeles.

F. G. Maloney, superintendent of the railroad department of the Elmira Water, Light & Railroad Company, has also been placed in charge of the maintenance of railroad equipment departmen and track and transportation department. A. C. Jordan, general electrical superintendent, formerly in charge of the maintenance of railroad equipment department, was relieved of its supervision owing to his increased responsibility in supervising the electrical department which has resulted from the great and continuous growth of the latter.

R. E. Cunningham Appointed to New Post

R. E. Cunningham, who for a number of years has been superintendent of distribution of the Southern California Edison Company, has been appointed to a newly created position, that of assistant manager of operation. Mr. Cunningham was graduated from the University of Illinois in the class of 1902 and very shortly afterward entered the service of the Edison company in Los Angeles. He served successively as lineman, district foreman and special foreman, and in 1907 he was promoted to the position of superintendent of distribution, which he has held up to the present time. Mr. Cunningham is well known for his work on some of the National Electric Light Association committees.

R. E. CUNNINGHAM

Robert H. Van Deusen has been placed in charge of the securities department of Stone & Webster in Chicago. Mr. Van Deusen has been connected with that office for more than ten years.

Charles W. Helser, president of the Majestic Electric Appliance Company, Inc., San Francisco, has severed his connection with that organization.

Joseph S. Buchsban, formerly connected with the Elyria division of the Ohio Public Service Company, has been transferred to the Lorain office in the capacity of meter superintendent.

C. F. Harris, for several years representative of the Westinghouse Electric & Manufacturing Company in Elmira, N. Y., has been transferred to the company's office in Rochester.

George R. Wilson, formerly connected with the Glens Falls district of the Adirondack Power & Light Corporation, is now affiliated with the commercial department of the general office at Schenectady. Mr. Wilson will engage in lighting sales promotion and in the development of a lighting engineering service for lighting customers.

Financial and Corporate

Utility Market Wavers

Election Week Brings a Mixture of Relatively Small Gains and Losses

A VERITABLE boom in railroad securities has developed since the election, with the result that the market's attention has been pretty much absorbed by the dealings of that description. The power and light stocks in general have moved little in either direction, and the volume of trading has if anything been smaller. Perhaps the issues in the utility group that benefited most immediately from the election returns were the two Northern Ohio Electric issues. The Akron voters gave the company the franchise that it was seeking and the preferred and common stocks moved forward in smart fashion. The net gain of the preferred was five points for the week, and that of the common two points.

Somewhat better levels were made by the various Electric Bond & Share Company issues, particularly the common stocks of companies affiliated with that organization. Lehigh Power Securities improved its position by four and a half points, for example, and smaller advances were made by such stocks as American Power & Light, Appalachian Power, Carolina Power & Light and National Power & Light. Republic Railway & Light and Portland Electric Power each rose four points. While these stocks were rising others were losing ground. Small declines were registered for the week by such issues as American Light & Traction, Arizona Power, Commonwealth Power and Western Power.

One of the issues that attracted particular attention as the week wore on and at the beginning of the present week is Alabama Traction, Light & Power Company's stock. In crossing 70 this issue improved its position by four points and established a new high record. Trading in this stock soon will be replaced by dealings in Southeastern Power & Light common stock, which is being exchanged for Alabama Traction, Light & Power Company stock.

New Capital Issues

Only two public utility offerings of significance were made during election week, but these, involving a total of $26,000,000, represented the most important flotations of the week. Even the smaller of the two was larger than any individual loan of another group. New capital issues of all descriptions aggregated only $38,567,000.

In connection with the new plan discussed elsewhere in the ELECTRICAL WORLD, the Cities Service Power & Light Company undertook its first financing by the flotation of a twenty-million-dollar issue of twenty-year 6 per cent secured sinking-fund bonds. The bonds were offered at 94½ to yield 6.50 per cent. The bonds constitute the only funded debt of the new company and are secured by the pledge of valuable collateral. This collateral includes the greater part of the stock, particularly common, in the six major operating groups of the new company. Interest requirements on the new series A bonds will be $1,200,000 annually, an amount which is covered 4.8 times by the $5,760,921 that was available for such charges in the twelve-month period ended June 30, 1924. Additional bonds may be issued, but only under conditions that are set down in the indenture.

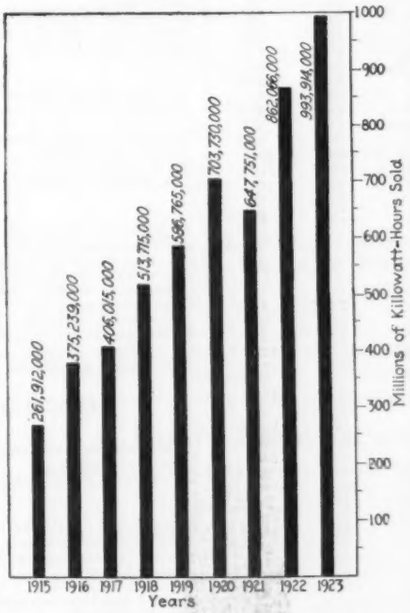
The Winnipeg Electric Company came into the market for a six-million-dollar issue of thirty-year 6 per cent refunding mortgage bonds. The bonds were retailed at 94½, at which the yield is 6.40 per cent. Proceeds of the loan are to be used in part to retire $3,250,000 of general mortgage and collateral 6 per cent bonds of 1943 and in part to offset capital expenditures already made. Net earnings of the company for the twelve months ended June 30, 1924, were $1,454,180, an amount equal to 1.8 times the total interest charges of the company on bonds presently to be outstanding.

A New Set-Up for Cities Service

Henry L. Doherty Organization Forms a New Holding Company to Separate Its Utility from Its Oil Business

BY PAUL WILLARD GARRETT

THE modification in financial structure that, as announced last week, has just been undertaken by the Cities Service Company, the Henry L. Doherty organization, represents one of the most interesting pieces of utility financing in recent years. The problem before the Cities Service Company differed from that which has puzzled other utilities. Cities Service originally was created as a public utility holding company, but, through ownership of its gas-producing properties, it afterward acquired oil lands. The oil business grew to such proportions that an investment in Cities Service holding company securities came to represent a substantial risk in oil as well as in utility enterprises. Such a diversity in risk was acceptable to many, but, with the unprecedented growth in popularity of public utility obligations, it stood as a stumbling block to investors who insisted upon a strictly utility risk. Through a virtual separation of its electric power and light, traction and gas properties from the oil properties, the Cities Service Company now has found a way to negotiate the sale of securities that involve only a utility risk.



ONLY DURING THE INDUSTRIAL DEPRESSION HAS THE OUTPUT OF THE CITIES SERVICE COMPANY SHOWN A DECREASE

NEW HUNDRED-MILLION-DOLLAR COMPANY

The old Cities Service Company will continue to be the parent holding company for the Doherty organization and will retain control in its present form of the oil interests. Substantially all of the utility properties are to be taken over, however, by a new holding company. The new unit is called the Cities Service Power & Light Company, an organization which will have an authorized capitalization of $100,000,000. The Cities Service Company will acquire the stock of the new Cities Service Power & Light Company.

Financing in the interests of the public utility enterprises hereafter will be undertaken through the newly created Cities Service Power & Light Company. While the parent company, the Cities Service Company, is in position to use oil profits to protect its equity in the new holding company, it is restricted in the amounts which it can take from the new company even in the form of dividends. The arrangement is designed to protect investors against the future appropriation of utility earnings for purposes of another department.

The companies that hereafter will be subsidiaries of the Cities Service Power & Light Company represent a diversified group of utility properties. They are situated in fifteen states and serve 330 communities. The six major groups already are known to many investors. They are: (1) The Ohio Public Service Company; (2) Toledo Traction, Light & Power Company (the Toledo Edison Company, subsidiary); (3) Public Service Company of Colorado; (4)

Stock and Bond Quotations of Electric Light and Power and Manufacturing Companies

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par value of stocks is $100.)

Companies	Bid Price Saturday, Nov. 8	Low 1924	High 1924
PREFERRED STOCKS			
Operating Companies			
Adirondack Power & Light 7 per cent	a 97	94	97½
Appalachian Power, 7 per cent	a 89	85½	90
Arkansas Light & Power 7 per cent	a 91½	81	93
Asheville Power & Light 7 per cent	96	96	99
Central Illinois Public Service 6 per cent	84	84	87
Colorado Power 7 per cent	a 92	90	98
Connecticut Light & Power 7 per cent	a104	99	106
Consumers' Power 6 per cent	a 90	85	93
Dayton Power & Light 6 per cent	84	84	90
Duquesne Light 7 per cent	105	103½	107½
Eastern Texas Electric 6 per cent	a100	81	100
Empire District Electric 6 per cent	73	70	78
Fort Worth Power & Light 7 per cent	99	97	102
Great Western Power 7 per cent	98	96	99
Illinois Northern Utilities* 6 per cent	a 82	82	87
Illinois Power & Light 7 per cent	a 92	84	95
Kansas Gas & Electric 7 per cent	94	92	97
Long Island Lighting 7 per cent	98	95½	102
Minnesota Power & Light 6 per cent	89	78	89
Mississippi River Power 6 per cent	a 87	80	90
Nebraska Power 7 per cent	97	89	99
Niagara Falls Power 7 per cent—25	27½	26	29
Niagara, Lockport & Ont. Power 7 per cent	101½	99½	104½
Northern States Power 7 per cent	a 95	91	97
Ohio Public Service 7 per cent	94	86	100
Pacific Gas & Electric 6 per cent	a 90½	85½	92½
Penn-Ohio Power & Light 7 per cent	90	84	96½
Pennsylvania Power & Light $7—no par	98½	93	99
Penn. Public Service 7 per cent	90	90	100
‡Philadelphia Electric 8 per cent—25	a 37½	29½	39⅜
Southern California Edison 8 per cent	116	112	120
Tennessee Electric Power, 6 per cent	a 78½	71	81
Texas Power & Light 7 per cent	97½	95	97½
Utah Power & Light 7 per cent	95½	94	96½
Western States Gas & Electric 7 per cent	a 82½	78	85
Yadkin River Power, 7 per cent	97	94	97½
Holding Companies			
American Gas & Electric 6 per cent—50	a 45	41½	46
American Light & Traction	a 93	91	94½
American Power & Light 6 per cent	a 90	84	91
American Public Service 7 per cent	88	84	92
American Public Utilities 7 per cent	a 88	73	90
American Water Works & Electric 6 per cent	a 95	66	99
Associated Gas & Electric	48	48	50
Carolina Power & Light	a 88½	82½	100
Central Indiana Power 7 per cent	88	80	92
Cities Service 6 per cent	81	67	83
Commonwealth Power 6 per cent	a 78½	72	82
Consolidated Gas 6 per cent—50	a 57	51	59½
Continental Gas & Electric 7 per cent	a 90	69	93
Electric Bond & Share 6 per cent	a102½	96½	103
General Gas & Electric—$8—no par	a102	96	103½
Middle West Utilities* 7 per cent	a 91	80	91
National Power & Light—$7—no par	a 94	84	96½
North American 6 per cent—50	a 48	43¾	50¼
Northern Ohio Electric	a 30	16	34
Public Service Corp. of N. J. 7 per cent	a 99½	96½	100½
Public Service Corp. of N. J. 8 per cent	a109½	99½	110
Standard Gas & Electric 8 per cent—50	99	95	106
‡United Gas Improvement—50	a 57½	55½	58
United Light & Power—$6.50—no par	83	75¼	84
COMMON STOCKS			
Operating Companies			
Adirondack Power & Light—50	a 31½	22½	34
Appalachian Power—no par	a 72	66	93
Arkansas Light & Power	a 60	22	63
Brooklyn Edison	a119¾	107½	120
Buffalo General Electric	151	118	155
Colorado Power	a 33	21	35
Commonwealth Edison*	132	126	135
§Consolidated Gas, Electric Light & Power	a 34	33	37½
Dayton Power & Light	153	70	160
Detroit Edison	a109¾	102½	110½
|| Edison Electric Illuminating of Boston	a182	163½	190
*Kentucky Hydro-Electric	87½	84	87½
Long Island Lighting	160	100	195
Mississippi River Power	a 33½	18½	34
Montana Power	a 65½	61½	71
Niagara Falls Power—no par	42	45	45
Niagara, Lockport & Ontario Power—no par	51	45	59
Northern Ohio Electric—no par	11	5	16
Northern States Power	a101	92	106
North Texas Electric	a 60	58	84
Pacific Gas & Electric	a 97	90½	99¾
‡Penn Central Light & Power—no par	60	57	60
§Pennsylvania Water & Power	a127	98½	127
‡Philadelphia Electric—25	a 38	29	39⅜
Public Service Co. of Northern Illinois	a101	97	104
Puget Sound Power & Light	a 52	43½	61½
Southern California Edison	a 99½	95	106
Tampa Electric	a168	134	167
Tennessee Electric Power—no par	a 40½	20	43
Virginia Power	55	16	70
Virginia Railway & Power	a 64½	36	72¾
West Penn. Co.	a 83	47½	98
Holding Companies			
‡American Electric Power—50	62	22½	62½
American Gas & Electric—no par	a 96½	43½	97
American Light & Traction	a136½	115	148
American Power & Light (new)	a 48	34½	48½
American Public Utilities	85	35	97
American Water Works & Electric	a109½	40	126½
Carolina Power & Light—no par	230	103	240
Cities Service	174	140	174
Columbia Gas & Electric—no par	a 43½	33	44½
Commonwealth Power Corp.—no par	a 98	56	109
Consolidated Gas—no par	a 73¾	60¾	75½
Continental Gas & Electric	a 83	49	96
Federal Light and Traction	a 87	75	91
General Gas & Electric	a 54	22	63
Lehigh Power Securities—no par	a 87	31	89
Middle West Utilities*—no par	a 78	41	86
National Power & Light—no par	a164	60	190
Philadelphia Co.—50	a 49½	42¾	53½
Power Securities—no par	a 10	4	14
Public Service Corp. of N. J.—no par	a 61½	39	63
Standard Gas & Electric—no par	a 38½	31½	40½
United Gas & Electric (Conn.)—no par	29	14	42
Utah Securities	a 35½	16½	37
BONDS			
Operating Companies			
Adirondack Power & Light	6s 1950	a102	97½ 103
Alabama Power	5s 1946	96	90½ 96½
Appalachian Power	5s 1941	a 95	89 95½
Brooklyn Edison	5s 1949	a100⅜	97½ 102¼
	6s 1930	a105⅜	102½ 106½
	7s 1949	107¼	107 110¼
Cleveland Electric Illuminating	5s 1939	101	98½ 101
Commonwealth Edison	5s 1943	99¼	95 100
	5s 1953	98½	92 99½
§Consol. Gas, Elec. Lt. & Pwr.	4½s 1935	a 94½	91½ 95
	6s 1949	104¼	102⅜ 105
Consumers' Power	5s 1936	98¼	94½ 99½
	5s 1952	a 91	87 92½
Detroit Edison	5s 1933	101	99 101½
Duquesne Light	6s 1949	a106	103½ 106½
Great Western Power	5s 1946	95	90½ 96
Kansas City Power & Light	5s 1952	a 96	89 96
Mississippi River Power	5s 1951	a 97½	92 97
Montana Power	5s 1943	a 99	95 99
New England Power	5s 1951	101	97 100
New York Edison	6½s 1941	a113	109⅛ 113⅜
Niagara Falls Power	6s 1950	105⅜	104 105⅜
Northern States Power	5s 1941	a 94⅜	89½ 94½
	6s 1941	a104½	101 104½
Ohio Power	7s 1951	106½	103 106½
Pacific Gas & Electric	5s 1942	a 94½	90⅜ 95
Pennsylvania Water & Power	5s 1940	99½	96 99½
‡Philadelphia Electric	5s 1966	101½	97 103½
	5½s 1947	105	99½ 105
	6s 1941	a107	103⅜ 107½
Portland Electric Power	6s 1947	a 95	89½ 97
Southern California Edison	5s 1939	100	96 100
	6s 1944	103½	100 103½
Tennessee Electric Power	6s 1947	a 98	93⅜ 98¾
Texas Power & Light	5s 1937	96½	91½ 96½
Toledo Edison	7s 1941	a109¾	106 110
Utah Power & Light	6s 1944	a 93½	87½ 93½
Holding Companies			
Alabama Traction, Light & Power	5s 1962	83	65½ 83
American Gas & Electric	6s 2014	a 95½	94 95½
American Power & Light	6s 2016	a 94½	91 94½
Amer. Water Works & Electric	5s 1934	a 92½	84½ 94
Associated Gas & Electric	6½s 1954	a 97½	92½ 97½
Central Indiana Power	6s 1947	95	88 95
Commonwealth Power	6s 1947	a 97½	87 98
Consolidated Cities Lt., Pwr. & Tr.	5s 1962	76½	64 76½
Illinois Power & Light	6s 1953	99½	95 100½
United Light & Railways	5s 1932	94	87½ 94
	6s 1952	96	92 97½
ELECTRICAL MANUFACTURING COMPANIES			
PREFERRED STOCKS			
Allis-Chalmers Manufacturing	a100	90	100½
*National Carbon	118½	112	125
Worthington Pump & Machinery	a 85	68	85
COMMON STOCKS			
Allis-Chalmers Manufacturing	a 60½	41⅝	66½
American Bosch Magneto—no par	a 25½	22½	38½
Electric Storage Battery—no par	a 60	50½	64
General Electric	a261	193½	281
General Electric—10	a 11½	10½	11½
*Hurley Machine—no par	a 61	48	65½
†Wagner Electric	20½	20	34½
Westinghouse Electric & Manufacturing—50	a 63½	55½	65
Worthington Pump & Machinery	a 40⅝	23½	47½
BONDS			
Canada General Electric	6s 1942	a107	102⅝ 107
General Electric	3½s 1942	83	80 83⅝
	5s 1952	a105	100 105½
Robbins & Myers	7s 1952	70	70 91½
†Wagner Electric Manufacturing	7s	100	97 101
Western Electric	5s 1944	a 99	96 99½
Westinghouse Electric & Mfg.	7s 1931	a108	106½ 109½

*Chicago Stock Exchange. †St. Louis Stock Exchange. ‡Philadelphia Stock Exchange. || Boston Stock Exchange. § Baltimore Stock Exchange.
a Bid price Wednesday, November 12.

Kansas City (Mo.) Gas Company and Wyandotte County Gas Company (Kansas City, Kan.); (5) the Empire District Electric Company (southwestern Missouri) and St. Joseph (Mo.) Railway, Light, Heat & Power Company.

As may be seen from the accompanying diagram, the electrical business of Cities Service has been growing persistently over a period of years. The annual kilowatt-hour output has risen from 261,912,274 in 1915 to 993,913,613 in 1923. The volume of business has, in other words, nearly quadrupled within eight years. The artificial gas business in the same period more than trebled in volume.

CAPITAL STRUCTURE AND EARNINGS

The Cities Service Power & Light Company will have bonds outstanding to the amount of $20,000,000, after which will follow authorized issues of $10,000,000 preferred stock, $5,000,000 second preferred and $65,000,000 common. The Cities Service Company itself has outstanding $25,966,715 of debentures, $85,522,856 of preferred stocks and $46,032,818 in common stock.

By examining the earnings of the companies that will go into the new group it is possible to determine the earning power of the new company as things stand now. The combined earnings for the twelve months ended June 30, 1924, were $49,100,222. That represents a substantial utility business in this country and places the organization among the largest of its kind. Net earnings applicable to fixed charges of the Cities Service Power & Light Company aggregated $5,760,921, an amount well in excess of interest requirements, as is shown elsewhere in the ELECTRICAL WORLD this week

Company Reports

Among the company reports issued during the past week for the month of September are the following:

Name of Company	Gross Revenues for September 1924	1923
American Power & Light Co..	$2,805,482	$2,682,712
Amer. Tele. & Telegraph Co..	6,360,137	5,796,462
Amer. Water Wks. & Elec. Co.	3,063,216	3,101,149
Carolina Power & Light Co...	229,669	202,390
Federal Light & Traction Co..	441,422	432,408
Fort Worth Power & Lt. Co..	255,555	263,260
Kansas Gas & Electric Co....	429,508	402,937
Milwaukee El. Ry & Lt. Co..	1,693,232	1,745,974
Nebraska Power Co.....	311,216	311,014
North American Company and subsidiary companies...	6,613,254	6,029,002
Pacific Power & Light Co....	273,413	288,106
Penn Central Lt. & Pr. Co....	294,880	289,100
Portland Gas & Coke Co.....	308,421	265,249
Texas Power & Light Co.....	558,769	519,337
West Penn Company.....	1,950,928	2,010,002
Yadkin River Power Co.....	183,491	154,615

Ohio Utility to Change Stock.—A special meeting of the stockholders of the Pennsylvania-Ohio Power & Light Company has been called for November 5 to reclassify $2,000,000 par value of the authorized and unissued 8 per cent cumulative preferred stock to 7.2 per cent stock. The dividends on this 7.2 per cent stock will be paid monthly instead of quarterly. No increase in capitalization is sought. The preferred authorization at the present time consists of 8 per cent stock amounting to $10,000,000 and 7 per cent stock amounting to $5,000,000.

Twelve-Million-Dollar Stock Issue Approved for Boston

Permission to issue 77,857 shares of additional capital stock of $100 par value at a price of $155 per share has been granted the Edison Electric Illuminating Company of Boston by the Massachusetts Department of Public Utilities. The total yield at this price is $12,067,835. The approval of the board carries no judgment upon the expenditures of the company in view of the pending rate cases, but the commission states that it is enough for the purposes of the petition that the company has made very large expenditures and has others under way in plant and system expansion that will permit readjustment in future of amounts capitalizable, if necessary. On September 1, 1924, the company retired bonds of $1,250,000 originally issued by the Boston Electric Light Company. The company desires to use part of the proceeds of this new stock issue to retire floating indebtedness incurred by the payment of these bonds. This the board approves, and it authorizes devoting the balance of the proceeds from the new stock issue to the cancellation of notes outstanding September 30 and to no other purpose.

Dividends Declared

The following quarterly dividends were announced by central-station companies and electrical manufacturing companies during the past week:

Name of Company	Per Cent	When Payable
Central Arkansas Ry. & Lt. pf...	1¾	Dec. 1
Central Miss. Valley Elect. pf....	1¾	Dec. 1
Cleveland Elect. Illum. 6% pf....	1½	Dec. 1
Federal Light & Traction, com...	$1	Jan. 2
Federal Light & Traction, pf.....	1½	Dec. 1
Georgia Ry. & Power, com.....	1	Dec. 1
Georgia Ry. & Power, 1st pf. 6%.	2	Jan. 1
Georgia Ry. & Power, 1st pf. 7%.	1¾	Jan. 1
Georgia Ry. & Power, 2d pf.....	1	Dec. 1
Norfolk Railway & Light.....	3	Dec. 1
Northern Texas Elec. Co., com....	2	Dec. 1
Tampa Electric Co.....	2½	Nov. 15
Kelvinator Corporation.....	1½	Nov. 15
Timken Roller Bearing.....	75c.	Dec. 5

Tennessee Electric Power Company.—Earnings of the Tennessee Electric Power Company for the year ended September 30 were $1,811,983, after allowance for fixed charges and dividends on first preferred stock. This amount is equivalent to $36.24 per share on the 6 per cent second preferred stock and $9.69 per share on the common stock, before provision for depreciation. Earnings after depreciation amounted to $19.44 per share on the 6 per cent second preferred stock and $4.31 per share on the common, as compared with $14.10 and $2.59 per share respectively for the same period last year—an increase of 38 per cent on the second preferred and 66 per cent on the common stock.

Brooklyn Edison to Redeem Bonds.—The Brooklyn Edison Company will redeem and pay off all of the Series D 7 per cent general mortgage bonds on December 1, the next interest date. The bonds, dated January 1, 1919, will be redeemed at 107½.

Italian Company Changes Name.—J. E. Aldred, president of the Italian Power Company, has announced that that company will change its corporate name for the purpose of broadening its activities. The new name will be International Power Securities Corporation. The operations of the new company will be in several European countries besides Italy.

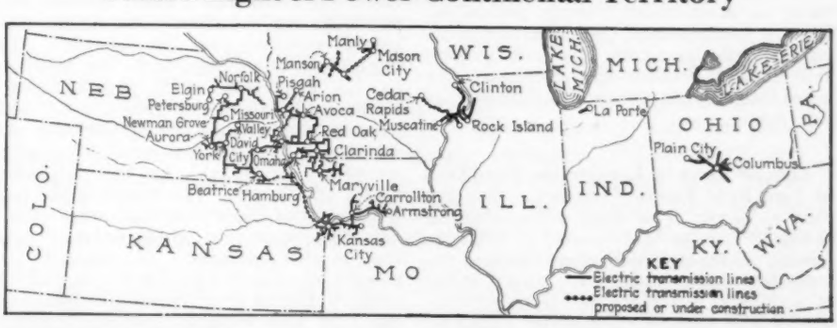
Chattanooga Utility Increases Capital.—The Southern Cities Utilities Company, Chattanooga, has amended its charter to provide for an increase in capital from $2,500,000 to $8,000,000.

Philadelphia Electric Listing.—The Philadelphia Stock Exchange has authorized the listing of $477,900 additional full-paid common stock of the Philadelphia Electric Company, making the total amount of that stock listed $58,952,500, par $25.

West Penn Stock Listed.—The New York Stock Exchange has authorized the listing of 7 per cent cumulative preferred stock, par $100, of the West Penn Power Company to the amount of $12,020,300, with authority to add $687,400 on official notice of issuance and payment in full.

Republic Railway & Light Reports Increased Net Earnings.—The Republic Railway & Light Company reports for the nine months ended September 30 net earnings from operations of $2,669,699, an increase of $316,281 over the same period of last year.

United Light & Power-Continental Territory



THE recent purchase of 75 per cent of the outstanding capital stock of the Continental Gas & Electric Corporation by the United Light & Power Company (see ELECTRICAL WORLD for October 4, page 754) makes of current interest the accompanying map showing the systems of both companies.

Commission Rulings

Bond Issues Against Additions and Betterments. — The Missouri Public Service Commission refused to entertain a contention of the Missouri Gas & Electric Service Company that it was not limited to issue bonds under the terms of the mortgage to 75 per cent of the amount expended for additions and betterments because other additions and betterments had been made to the property of the company in large amounts for which no bonds had been issued. "That contention is not sound," the commission said. "There is no escaping the terms of the mortgage and we are bound so to rule."

Inductive Interference and Inferior Line Construction.—In passing upon a complaint of inductive interference made by the Postal Telegraph-Cable Company against the Marshall Ice & Power Company, the Illinois Commerce Commission criticised the construction of the power company's line, a three-phase, 6,600-volt line running to Martinsville and supplying rural consumers along the route. It especially condemned the raking of poles to obtain increased clearance, the depreciation of individual poles and the close proximity of the supply wires to the signal wires. The telegraph lines also, the commission said, were in need of rehabilitation, existing conditions constituting a public hazard and jeopardizing both services. The lines could be reconstructed jointly at much less total investment than would be required for the erection of two separate lines, and a joint line could probably be maintained at less expense. Furthermore, joint construction would probably eliminate a number of crossings between wires and over the public highway and, in the opinion of the commission, was for these reasons preferable to the use of two lines under existing conditions of clearance. The companies were therefore ordered to confer and to agree, if possible, on one of the following plans: (a) Joint construction of signal and supply lines; (b) separation of the lines so neither will conflict with the other; (c) reconstruction of both lines in present locations to meet requirements prescribed by the commission. Should the companies fail to agree, the commission said it would order the adoption of a plan that would serve the interest of the public.

Longer Term a Reasonable Condition of Low-Rate Power Contract.—Holding that a longer term may reasonably be required for service under a low-rate power contract which may require extraordinary investments than under other power contracts and lighting contracts, the Illinois Commerce Commission dismissed a complaint made against the rates charged to and term of contract required from the Western Pipe & Steel Company by the Commonwealth Edison Company. A five-year term, the commission determined, was necessary because the rate provided under contract form "C" is exceedingly low and under certain conditions large special investments are required to furnish service to rate "C" consumers. A further attack made on a certain phase of the contract was dismissed also, the commission holding that the provision attacked did not affect the complainant and was therefore irrelevant. A contention that the terms of schedule "C" were ambiguous and contradictory was, the commission declared, ill-founded.

Reimbursement of Consumer for Meter—Comparison Between Rates in Different Communities.—The village of Webster complained to the Wisconsin Railroad Commission that the Burnett County Light & Power Company's rates were discriminatory as between Webster and other villages and also that a promised refund for meters had not been made. In dismissing the complaint against the rates the commission said that the Webster schedule, which encouraged the use of energy owing to a decreasing charge with increased consumption, was the more scientific, and that a difference in the character of the service rendered two communities and in the relative consumption indicated justification for differential rates. On the second point the commission said that an electric utility which removes direct-current meters and charges for new meters should reimburse customers presenting legitimate claims involving purchases of direct-current meters from a predecessor utility which agreed to give a monthly credit to consumers owning their own meters and promised reimbursement.

Recent Court Decisions

Supreme Court of Illinois Upsets Electrical Ordinance of Chicago. — Harry Arms and 112 other master electricians and electrical contractors applied to the Circuit Court of Cook County for an injunction to prevent the city of Chicago from enforcing the electrical ordinance passed by the city in 1922 under which an examining board was set up to ascertain the qualifications of applicants for licenses to do electrical work, qualifications being established and fees fixed. The Circuit Court denied the application and dismissed the bill for want of equity, allowing an appeal to the Supreme Court of Illinois. The latter court has reversed the decree of the lower court and remanded the cause, holding that the city's ordinance is beyond its powers in that it exceeds the authority conferred upon it by those provisions of the city and villages act upon which the enactment of the ordinance had been based. The Supreme Court reaches this conclusion after an examination of the sections and subsections of the act in question. In conclusion it says: "The question of what powers may be exercised by a municipality is for the General Assembly and not for the courts. The question here is whether the Legislature has in fact delegated to the city the power which it seeks to exercise, in direct terms or as necessarily incidental to some power expressly granted. The propriety of examining and licensing electricians we are not called upon to determine. It may be admitted that electricity is a dangerous agent, that fires often originate from crossed wires and defective insulation, and that the regulation of electrical construction work and the licensing of electricians is not only salutary but necessary. Regulations of a similar character have been sustained in other jurisdictions. . . . The factory inspection law of this state is limited to the inspection of wires and apparatus in factories and cannot be invoked to sustain the ordinance in question here. The General Assembly has not granted to a city or village the power to license electricians or to impose fees for inspecting electrical construction work, hence the ordinance requiring such licenses and imposing such fees is void for want of authority to enact it."

Police Power of States Again Affirmed by United States Supreme Court.—Without a written opinion, acting upon authorities cited, the United States Supreme Court on October 27 affirmed a decision of the Oklahoma State Supreme Court, which had denied an injunction sought by the Southern Oil Corporation to restrain the Yale Natural Gas Company from charging a rate for gas higher than the contract rate even though granted authority for an increased rate by the Oklahoma Corporation Commission. The issue involved the right of the Corporation Commission to order rate increases affecting contracts and the authority of the Legislature to enact laws to this end.

Commission Not Obligated to Report Valuation in Detail.—Affirming an order of the Public Utilities Commission of Ohio fixing telephone rates which was attacked by one Lindsey, the Ohio Supreme Court said, in answer to the contentions of the appellant: "Where the property of a public utility used and useful for the convenience of the public in size and character is not unlike many other properties and its value can be ascertained by inspection and comparison, it is not an abuse of discretion for the Public Utilities Commission to fail to ascertain and report value in any greater detail than to show the ultimate facts required. The Public Utilities Commission of Ohio is authorized by statute to avail itself of the services of its engineers and other assistants in determining any issue before it, including the issue of value. The reports of its engineers and assistants when filed in a case become evidence therein and may be analyzed or impeached, like other testimony." (144 N. E. 729.)*

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Manufacturing and Markets

Standards Must Be Sold to Industry*

Machinery for the Promotion of Adopted Standards Needed to Bring About Their More Prompt Acceptance and Use— Why Progress Has Been Slow

By E. C. Peck
Cleveland Twist Drill Company, Cleveland, Ohio

THE marked impetus given to standardization in its various forms since the World War is very encouraging, but the surface has been scratched only. There is a tremendous amount of work yet to be done if America is to take the position which her previous work entitles her to occupy. Considerable progress has been made in developing working standards, and there are many committees busily at work on some of the most needed standards.

The American Engineering Standards Committees is the recognized national clearing house for industrial standardization. Through its methods and procedure all organizations concerned participate in deciding whether a given piece of work shall be undertaken, in developing the standard and in recommending its approval. This committee has under consideration, or has approved, 152 projects and there are 235 national bodies, technical, industrial and governmental, co-operating on the work through officially accredited representatives. The number of individuals engaged on sectional committee work is 1,081. The work of this committee is of the utmost importance to all industries and the effects of the work are far-reaching.

It is believed that the machinery for setting up and developing a standard is adequate at this time and that this machinery will expand sufficiently to take care of the growing needs of industry. But there is in operation at the present time no adequate means of getting these standards adopted. When the A. E. S. C. approves a standard it is ready for American industries to adopt and use, and if any one of these industries is aware of a standard which will apply to its particular field, it may have sufficient interest to find out where to get a copy of the standard and to do so.

After receiving the standard the industry in some cases puts it into effect; in others it is filed for future use, with the result that it is soon forgotten. There seems to be no definite movement toward notifying the public about these standards, what they are for or where to get them. It seems to be assumed that the public is going to be sufficiently interested to hunt out the standards and introduce them. That the general public is not sufficiently interested to do this is evidenced by the slowness with which the standards are being adopted.

Why Adoption Is Slow

Why have these standards been so slowly adopted? The dilatoriness seems to be due to one or more of three things:

(a) Lack of information that there is a standard applying to the industry.

(b) Lack of merit in the standards.

(c) Lack of interest due to the inertia of the engineering personnel of the industry concerned.

From the many favorable reports of those industries which have adopted some of the standards, and in view of the carefulness with which the standards are accepted, they can hardly lack merit. It seems obvious that if they were lacking at all in merit, criticisms would pour in, as most engineers readily find fault with a standard if there is any chance whatever to do so. The writer is therefore of the opinion that the principal trouble is traceable to the lack of interest in the engineering personnel, if it be conceded that the standards are known.

This inertia on the part of the engineer will ultimately react against him and his profession. Just as soon as the administrative and selling departments become fully aware of the advantages accruing from the adoption of proper standards they will force the adoption of standards that the engineer should have sponsored. The engineer will thus not only lose the credit of initiating a live movement, but at the same time he lays himself open to the criticism of the management that he is a "back number."

Many manufacturers are of the opinion that adopting a standard means throwing away a lot of expensive tools, equipment, etc. Others think the expense will be so great that they never even look into it. The proper body carrying on a campaign of education could soon correct this state of mind and get manufacturers to adopt all standards as fast as they are approved by the A. E. S. C.

The writer has yet to see an approved standard which is not based on the best current practice, and of course the best practice ought to be suitable for almost every one. It is well known that any standard set up may have objections from some viewpoint, even though this standard represents 90 per cent of the best practice. There may even seem to be good reasons why the standard cannot apply to particular cases, but if we hang back and do not adopt it because of this, we shall only retard standardization and fail to obtain the benefits we should derive.

It is the adoption and use of a proposed standard which finally determines its real value to the industries. If we wait until a proposed standard receives 100 per cent approval of the public, we shall never approve any; hence let us assume that the approval of a standard by the A. E. S. C. is sufficiently near 100 per cent perfect to be worthy of a fair trial.

Adoption May Be Gradual

In adopting a standard it is not at all necessary to throw away the old articles or models and thus incur a large expense. The standard does not have to be adopted some morning when the whistle blows for beginning work. Very often it is better to apply the standard to all new work and thus gradually work into it without much expense. A number of factories with which the writer has a close acquaintance adopted the screw-thread standard, for example,

*Abstract of a paper presented at the recent annual Machine Tool Exhibit, Yale University, New Haven.

without confusion or delay, and the expense was almost negligible, being almost entirely confined to new standard gages which were needed in any case to replace worn-out gages.

Some standard specifications and tests can be adopted at once and with very little cost because no change is involved, there being only a hit-and-miss method in use. In such a case it is merely adopting a definite method in place of guesswork. Either a central body should be established to promote the adoption of these standards or the job should be assumed by the local engineering societies which exist in nearly all large cities of the country. If each one of these branches or societies were to organize a standardization promotion committee and make an active campaign on the subject, I believe great results would follow.

Canadian Electrical Market Important

More Business Possible with Greater Effort by United States Manufacturers—Local Production Growing with American Branch Factories Prominent

PROBABLY more electrical business could be done in Canada than is the case today if more intensive sales effort were made by American manufacturers, according to an article in the current issue of *Commerce Reports*. Many business men apparently make their sales appeal in that market only through advertising or through correspondence and seldom get the advantage that results from personal contact with the buyer. Canada is so close and travel so free from formality that more consideration could advantageously be given to this point.

Few manufacturers have analyzed Canadian possibilities as closely as they have those of countries that are really foreign to us, and consequently few realize the magnitude of our electrical exports to Canada. Although in recent years there have been a great many branch manufacturing plants established across the border by electrical manufacturers of this country, a study of statistics for a period of years shows that there has still been a well-maintained growth of the shipments of electrical products to the Canadian market.

CENTRAL-STATION DEVELOPMENT AN INDEX

The extent of the central-station development of the country is naturally an index of its possibilities as a market for electrical goods, and in Canada this development has kept pace with that of the United States. As a matter of fact the annual kilowatt-hour consumption per capita in Canada has lately exceeded that of the United States. Possessing extensive water-power resources, Canada's progress in this field has been marked, and today there has been developed 3,227,000 hp. of the total minimum potential 18,250,000 hp. of the country's known water-power possibilities. Of the developed water-power, 2,411,700 hp. is in central-station plants. In addition, central-station systems of the country operate steam and other prime-mover plants aggregating 147,109 hp. Although transmission networks do not cover Canada as thoroughly as they do the more populous districts of America, there are nevertheless a number of large distribution networks in the better-settled areas which make electric service available in numerous outlying districts where individual central-station service would hardly be feasible, at least for some time to come. An important percentage of the population accordingly enjoys electric service.

The major portion of the electrical machinery and equipment requirements of Canadian industry are not, of course, supplied from abroad, since there is in the country a well-developed electrical manufacturing industry. A goodly portion of this is represented by branch factories of American electrical manufacturers, with a few plants operated by well-known British manufacturers. However, in spite of a growing domestic production, exports of electrical goods from this country are such that Canada is one of our most important customers, she having last year purchased from us over $11,000,000 worth of electrical goods, without taking into consideration electrical products shipped to Canada incorporated with various types of industrial machinery, automobiles and the like. Formerly our exports to the Canadian market were very broad in scope, but in recent years there has been somewhat of a decrease in heavy apparatus sales to that market and a tendency toward those electrical lines which are made in large quantities in this country and toward those special appliances which have been developed in the United States to a greater degree than elsewhere. There has also, as might be expected, been a considerable exportation of parts of equipment shipped to Canadian branches for assembly.

American electrical manufacturers sell their products in Canada along much the same lines as they market them in this country. The larger manufacturers have branch plants there, with branch sales offices in a few of the larger centers, while the smaller manufacturers work through local exclusive distributors and through jobbers. Retail selling outlets are much like ours, and selling campaigns for appliances are carried on now and then as in this country. The activity of the central station in the merchandising field is about the same as in the United States, as would naturally be expected from the close affiliation of Canadian central stations with the engineering societies and electrical associations of this country. Except for tariff requirements, an American electrical manufacturer can pursue his American selling policy in Canada with but slight modification for local conditions.

CANADA A GROWING FIELD

Since Canada is a country with a high standard of living and inherently with labor costs approaching ours, it must naturally continue to make all possible use of power in the development of its manufacturing industries and in the exploitation of its natural resources. The use of electrical apparatus and appliances of all kinds must, therefore, naturally continue to expand. While the production of its home electrical industry will undoubtedly increase, there will still remain a growing field in which American manufacturers can participate, either in the shape of partially finished electrical equipment materials and devices for assembly in Canada or in the shape of finished products in the classes commented on above and in electrical goods generally, where the nearness of the American seller to the Canadian buyer gives the former an advantage over manufacturers elsewhere.

Foreign Commerce Handbook

ELECTRICAL manufacturers who are seeking additional export outlets will find information of value in the solution of many of the problems involved in foreign trade in the Foreign Commerce Handbook for 1924-1925, which has just been issued by the Foreign Commerce Department of the Chamber of Commerce of the United States. The pamphlet is designed to contribute to a wider appreciation of the facilities available to American business men in the conduct of overseas trade. Sources of information and service are listed under ninety separate headings, such as acceptances, advertising, bills of lading, chartering, incorporation abroad, harbor charges, samples, etc. The handbook also contains a review of the constructive action that has been taken by the Chamber of Commerce of the United States with reference to the proper handling of foreign trade matters.

Business Conditions

FROM every part of the country comes the news this week that better sales of supply lines have been made and that steady improvement of business is continuing. Motors, which have been selling "off" all year, are showing a better movement in New England. While many small orders have been released in the past few days, it is yet too early to note any large buying in the electrical industry since the election. Several companies report that October sales were very good, and from present results November is expected to be better. The non-ferrous metal market has been steadily strengthening, and with the increase in copper, copper products have advanced.

The enormous trading in shares on the stock market since the election indicates the confidence of the public in better general business. The increase in steel-ingot output for October, when the average daily production was 115,239 gross tons, as compared with 108,269 tons in September, shows that an improvement was in progress even at that time. Now comes the further news that sheet-steel mills and textile mills are either increasing operations or making preparations to do so.

In New England the outlook is brighter, with better sales, and confidence is widespread that the remainder of the year will witness a marked expansion of trade. Inquiries have increased in this district, and the week's sales have been widely distributed. A good volume of business is being transacted in the New York district, with sales spotty, but the trend continuing distinctly upward. In the Southeast trade continues to show steady improvement. Ranges are selling well in this territory and are particularly active in Florida. The tone of business in the Middle West has improved, and while there has been no marked increase in volume, the feeling of depression and anxiety which existed has abated. Central-station expansion is very active in this district. On the Pacific Coast an appreciable improvement is noticed, and the power companies are jubliant over the state-wide condemnation of the water and power act in California and of the Bone bill in Washington as well as over the relief of the water shortage.

Demand for Ball Bearings Rapidly Growing—Prices Stable

THE demand for ball bearings in the electrical field has been rapidly growing. The recent activity in the application of ball bearings to electric motors as well as many other types of industrial equipment has been largely responsible for the increased interest. It is estimated that during the present year the electrical field has been absorbing ball bearings to the extent of half a million dollars. The quantities of the present individual demands may not be so large as in the past, but manufacturers believe this to be undoubtedly owing only to present market conditions in the individual industries. Further, it is believed that the future demand will probably be in excess of anything that has gone before as these industries broaden out their activities and as the market absorbs their production.

While prices are at present well stabilized, some concessions were made early in the year in the effort to develop more business. No price revisions are in contemplation, but competition is keen, and as the production capacity of the ball-bearing industry is increased to meet the demands made on it it is believed that the price trend will be downward. In general, manufacturers are able to maintain delivery schedules without difficulty as the plants of the ball-bearing companies are sufficiently large to meet the demands of the market and probably to provide for the increased sales of the near future without further expansion.

German Electrical Industry at a Disadvantage in Foreign Trade

CONDITIONS in the electrical industry in Germany are said to be less satisfactory than for some time, according to the Department of Commerce; but on the other hand the lack of activity in the domestic market is stimulating more aggressive export efforts. However, the German manufacturers of machinery find their ability to compete in export markets seriously impaired, not only because their prices are above the world market level in frequent instances, but also because of the fear of foreign buyers that the unsettled conditions in Germany may delay deliveries and because of the lack of facilities for offering liberal terms of payment. In addition high taxes and freight rates have done their share toward increasing prices, and the location of a factory is of great importance when shipments are made for export.

The inflation of German money, as pointed out in the twenty-eighth annual report of the Siemens-Halske and Siemens-Schuckert Works (1922-1923), made it impossible to realize profits, although a satisfactory number of orders was received and the number of employees reached at times the highest record. The new German loan should materially better these conditions. German machinery encounters chiefly British, French and American competition in the export field. American manufacturers have been very keen competitors at times. Despite these difficulties German exports of electrical manufactures are on the increase. During 1923 German electrical exports reached 34 per cent of the total reported by the five leading countries. In 1913 they were 51.5 per cent of this total, while in 1920 they were 34 per cent and in 1921 only 21 per cent.

More Activity in Non-Ferrous Metal Market—Prices Increase

MORE activity has been evidenced in the non-ferrous metal market than for some time. Substantial buying by consumers has helped to strengthen copper and zinc prices. Producers are more cheerful about the outlook than for some time, probably as a result of the better business sentiment since the election. Good domestic consumption of copper coupled with export sales has caused a few producers to decrease the size of their offerings. Copper has been moving slowly but steadily toward a higher price level. Sales were freely made at 13⅜ cents at the end of last week, but early this week no difficulty was experienced in obtaining 13⅞ cents with 14 cents for shipments in January. Brass companies in the Connecticut valley and sheet-copper manufacturers are reported to be doing a good business, despite the advance in prices. The feeling is prevalent among manufacturers that the spread between the finished product and the price of the raw material should be changed.

NEW YORK METAL MARKET PRICES

	Nov. 5, 1924 Cents per Pound	Nov. 12, 1924 Cents per Pound
Copper, electrolytic	13¼–13½	13¼–13.95
Lead, Am. S. & R. price	8.65	8.65
Antimony	12½	15½
Nickel, ingot	29–30	29–30
Zinc, spot	6.92½	7.15
Tin, Straits	53⅛	54⅛
Aluminum, 98 to 99 per cent	28	28

The official contract price of the American Smelting & Refining Company for lead remains at 8.65 cents, but the metal is in a strong position and foreign sales are very good. Zinc sales have been unusually heavy for domestic consumption as well as for export, and the price has moved up somewhat. Fair tonnages of tin have been purchased, with consumers displaying a discriminating attitude.

Delinquent Electrical Accounts Decrease Materially

ALL five of the districts reporting to the National Electrical Credit Association for October showed decreases in the average amount of delinquent accounts over the preceding month. The complete report follows:

DELINQUENT ACCOUNTS IN OCTOBER

Branch and Month	Number of Accounts Reported	Total Amounts	Average Amount
Central Division:			
September, 1923	760	$95,252.94	$125.33
September, 1924	971	106,842.84	110.03
October, 1923	981	117,653.05	109.74
October, 1924	882	95,059.06	106.78
New York.			
September, 1923	365	61,731.00	169.00
September, 1924	338	55,652.00	165.00
October, 1923	442	77,479.00	175.00
October, 1924	300	34,083.00	113.00
Philadelphia:			
September, 1923	246	27,955.15	113.64
September, 1924	243	28,231.73	116.18
October, 1923	326	32,547.98	99.84
October, 1924	217	23,777.23	109.57
New England:			
September, 1923	56	8,156.49	145.65
September, 1924	62	6,385.51	102.88
October, 1923	51	3,808.88	74.68
October, 1924	14	8,788.38	135.20
Pacific Coast:			
September, 1923	26	6,998.20	269.16
September, 1924	25	3,137.67	125.50
October, 1923	23	5,804.78	252.38
October, 1924	45	5,578.65	123.97

Tone of Middle Western Business Improves with Election Over

IN THE Middle West business continues very good. While there has been no marked increase in the volume since the election, it is quite evident that the feeling of depression and anxiety has abated. Encouraging reports are received of active expansion in the Northwestern territory by the Northern States Power Company. Reports of additional expansion work are received from the Southwest, and one utility constructing a 66,000-volt high-tension line has made a sizable purchase of transformers. Many smaller jobs are being contracted for in and around the Chicago territory, and maintenance purchases have increased matetrially. Several orders totaling more than $100,000 for spare turbine parts were placed this week. Pole-line hardware sales remain active, and the demand for auxiliary equipment and motors has accelerated somewhat.

Jobbers feel confident that this fall's business will surpass previous established standards. The demand for code wire has been good, together with a healthy increase in wiring device sales. Some slight price revisions in wiring devices were made, and wire manufacturers advanced prices on November 10 in line with the rising copper market. Radio sales, as expected, are exceptionally good, leading to large orders by distributors. One distributor placed an order recently for about $50,000 worth of tubes.

Sales Spotty with Volume Good in the New York District

TRADE in the New York district is reported as somewhat spotty with a good volume of business being transacted and with the trend continuing distinctly upward. Several companies report that October sales were good, especially in the latter part of the month, and one company reports the receipt of a nice order for control equipment. Central-station companies continue active in the purchase of auxiliary equipment, one manufacturer reporting that his sales of watt-hour meters for the first six months of the year were 25 per cent ahead of those for the same period a year ago and that present sales are in the same ratio or better. There has apparently not been sufficient time since the election to close business which has been held over, but in more than one instance a number of small orders seemed suddenly to be released within the last week. With zinc prices increasing and steel becoming firmer, it is rumored that pole-line hardware should shortly increase in price. It is also believed that fir cross-arms cannot long remain at the present price.

Jobbers report a decided improvement in sales with no special demand for any particular apparatus. Pipe, wire and wiring devices are in good demand and radio sales have increased considerably. It is rumored that radio stocks are already depleted. With the increasing cost of copper, wire prices were increased on November 10, but, despite this armored conductor cable was slightly reduced on the same day. Washing machines and appliances are reported as selling very well, and collections in general are considered fair to good.

Sales Steadily Show Improvement in the Southeast

BUSINESS in the Southeast continues to show a steady improvement, though there are no outstanding orders in hand excepting one for $100,000 for telephone equipment from Forida. Telephone business generally in that state is excellent, with considerable improvements and extensions reported at St. Petersburg. Electric ranges are selling well over the territory and are very active in Florida. A representative of one of the largest range manufacturers has stated that out of his territory of nine states 25 per cent of the coming year's business will be from Florida. New construction in nine Southeastern states in October amounted to approximately $65,000,000, which is 41 per cent over September figures and 60 per cent over October, 1923. Building in the same territory for the ten elapsed months of 1924 amounted to $523,043,900, which is 23 per cent in excess of the same period of 1923.

Industrial business is showing signs of activity and several large orders will be closed this week by local jobbers, the materials going to railroad shops, textile mills and large hotel apartment buildings. Line materials are selling well, with satisfactory orders for poles also reported. Socket appliances are particularly active with the exception of electric heaters, which have slowed up on account of very mild weather conditions. Jobbers are reporting a stimulated activity among dealers for Christmas specialties and holiday goods, and the outlook for the season is bright. The better-home-lighting campaign is apparently being reflected in the increase in small orders for residential lighting fixtures from the section generally.

Outlook Brighter with Better Sales in New England

ALL along the line in New England a striking improvement in the business outlook has followed the election. Confidence is widespread that the remainder of the year will witness marked expansion of trade, and many orders have been released since the election. Inquiries are increasing by leaps and bounds, and the week's trade has been made up of widely distributed sales. Boston has bought underground cable for central-station development; Gloucester, Mass., has purchased line material, and substantial shipments of poles and cross-arms have gone to southern New England. Line tools are also moving actively. One jobber reports active inquiries for transformers.

A slight improvement is evident in the electric motor market. The sale of alloy material is in good volume in the electric furnace field, and while the better-home-lighting campaign occupies the center of the stage, much good work is being done in commercial lighting betterment in this section, notably at Montpelier, Vt., Haverhill, Mass., and Bristol, Conn. Contractors are still buying cautiously in wiring devices. Appliance sales are improving, and at Malden Mass., 150 vacuum cleaners have been sold in eight days following the election, compared with the same number for the entire year prior to November 4. The municipal light department at Burlington, Vt., has been authorized to buy a 1,000-kw. steam turbo-generator.

Sales Show Good Improvement on the Pacific Coast

BUSINESS has shown an appreciable improvement on the Pacific Coast, although it is too late in the year for much railroad or power company buying. Very good sales are predicted for 1925. The power companies are jubilant over the state-wide condemnation of the water and power act recorded by a two-to-one vote against it. On the other hand, an amendment providing that the Klamath district in northern California be made into a public game and fish preserve instead of being utilized for power purposes was carried. In the State of Washington the defeat of the Bone bill by a majority in excess of 70,000 is expected to react favorably on private hydro-electric power development. Rubber-covered wire has advanced 3 per cent rather unexpectedly, so that few orders were booked on the chance of it. Copper wire has also increased 25 cents per 100 lb., and other copper wire advances are considered likely, but other prices are steady. An inquiry for over 100,000 ft. of ½-in. and ¾-in. unfinished iron pipe is recorded from the San Francisco Bay district. Motor business in California is improving, but there has been a decrease in demand for fractional-horsepower sizes.

Radiator sales have shown a marked improvement during the present cold spell, and heavy-duty heaters are also selling better as a result of the missionary work of the summer. In the northern section of the Pacific Coast schedule materials and wiring devices are not selling so quickly now that the building season is advancing.

Activities of the Trade

Portland Jobber's Business Expanding Rapidly

The Eastern Electrical Supply Company, Portland, Me., is about to add another floor to its establishment at 45 Market Street, thereby tripling its present facilities for the stocking of wholesale electrical material. George D. Montgomery, Jr., president, states that 1924 sales will probably exceed those of last year by 40 per cent and that this house is now actively developing trade in New Hampshire in addition to Maine. Two additional salesmen have been put on the road this fall and a number of lines have been taken over including the products of the Adams-Bagnall Company, Cleveland; the Rome Wire Company, Rome, N. Y.; miniature lamps of the Federal lamp division of the General Electric Company, the Trumbull-Vanderpoel line, Laundryette washer, Thompson line of radio apparatus and Joseph W. Jones (New York) line of radio parts. An informal convention of electrical dealers from northern New England was scheduled at the Eastern company's headquarters in Portland for Saturday of last week, more than six hundred invitations having been sent out to the trade.

Westinghouse Receives Order for Electric Car Equipment

The Westinghouse Electric & Manufacturing Company has received an order from the Long Island Railroad for $450,000 worth of electrical equipment for forty new cars. These cars represent the 1925 allotment of the Long Island Railroad, the purchase of which has been necessary to handle the increasing commuter traffic.

Alloy Metal Wire Company Purchases Pennsylvania Property

The Alloy Metal Wire Company, Grand Central Terminal Building, New York City, manufacturer of resistance wires, pure nickel, monel metal and other nickel alloys, recently purchased the plant of the Du Pont Motors Company at Moore, Pa., a suburb of Philadelphia. The property contains approximately seven acres, on which is erected a modern plant of steel and brick construction, covering 75 ft. x 300 ft., the main part being three stories high. In addition to this, there are also a power house and warehouse.

The company has recently installed three new annealing furnaces, one new 3-ton electric crane, ten new continuous, fine-wire-drawing machines and ten wire-mill trucks, as well as new electrical equipment. It expects to move its general offices to the new plant about December 1. The original cost of the property, exclusive of machinery, is said to have been $250,000.

The Pittsburgh Reflector Company is the new name of the Pittsburgh Reflector & Illuminating Company, Bowman Building, Third Avenue and Ross Street, Pittsburgh. This change has been made in order to simplify the name of the company as well as to tie it more definitely to its trade mark.

The Hart-Parr Company, Charles City, Iowa, has appointed Eugene Foulke, for several years in charge of the Western Electric Company's home appliance sales in New England, with headquarters in Boston, as sales manager of the electric washing machine division of the company.

The Trumbull Electric Manufacturing Company, Plainville, Conn., manufacturer of electrical supplies, has appointed Clarence D. Munger as Connecticut representative. Mr. Munger was formerly salesman for the Southern New England Electrical Supply Company.

Canadian Vickers, Ltd., Montreal Canada, has secured an order for two hydraulic turbines which will have an output of 12,650 hp. each. The turbines will be installed at Lake Coleridge, in the South Island, and will provide power for Christchurch, Ashburton, Timaru and district.

The Line Material Company, South Milwaukee, Wis., announces that its Indianapolis branch is now established in new quarters at 230 South Pennsylvania Street, that city.

New Equipment Available

Low-Head Centrifugal Pump

A new low-head centrifugal pump built in the smaller sizes and similar to the company's type "S" line, except that a number of mechanical improvements are incorporated, is being placed on the market by the Allis-Chalmers Manufacturing Company. By the elimination of a number of hydraulic losses the pump is said to be higher in efficiency. Bronze companion wearing rings that are L-shaped are provided to reduce disturbance in suction passages and increase efficiency. Split bronze inclosed glands with a drain to prevent the water from being thrown off or entering the bearings, bronze bushings on the stuffing-box throat, removable cast-bronze sleeves on an annealed steel shaft and a double-acting, center-collar thrust bearing on the outboard end that is firmly fixed and locked in place are features of the new pump. Two oil rings in split bearing shells having self-closing oil-hole covers and oil-level-indicating cups are provided on the side of the bearing. The characteristic curves of the new 5-in. pump show that when pumping 900 gal. per minute against a 68-ft. head an efficiency of 80 per cent is obtained, while for 520 gal. per minute to 1,120 gal. per minute the efficiency is above 70 per cent.

High-Capacity Oil Circuit Breaker

A high-capacity oil circuit breaker with horizontal venting slots that close up loosely with light metal plates, hinged at their upper edge, and are placed above the oil level, near the cover of the oil tank, has been developed by the Voigt & Haeffner Company, Frankfort on the Main, Germany. In the design of the breaker artificial mechanical means to suppress the arc, like explosion chambers, etc., were considered unnecessary complications. The breaker has a very long contact stroke and an extremely high contact speed. A very powerful spring mechanism accomplishes an opening speed of 1½ meters per second, but in spite of this high speed the mechanics of the motion are such as to terminate the stroke without undue impact. These switches require considerable mechanical effort to close, so that for remote-control use either heavy direct-current solenoids may be used or a spring motor which is set under tension by a small three-phase motor. The breakers are made in 350, 600 and 1,000-amp. ratings and are all of the same size, because they are designed primarily for short-circuit capacity. A direct-acting electromagnetic relay, under the cover of the breaker, releases a train of gears, which in turn unlatch the opening mechanism. The breakers are rated at 300,000 kva. rupturing capacity.

Electrically Operated Typewriter

A new typewriter operated by a 10-watt electric motor has been brought out by the Woodstock Typewriter Company, 216 West Monroe Street, Chicago. This typewriter is not essentially different in appearance from the manually operated machine. The motor runs continuously when the machine is in operation and the operator has only to start the typing motion, electricity completing the work. The motor controls the electric keyboard except for back-spacing and carriage return. It drives a cam having teeth and against these teeth lies an actuator which is started by the operator's touch on the keys. Then the teeth engage the actuator and move the type. The motor may be said to function much like a relay in an electric circuit.

Corridor Lighting Unit.—A new type of asymmetric lighting unit designed for the illumination of corridors, aisles, passageways and similar places that is known as No. C-2172, has been designed by the Holophane Glass Company, 342 Madison Avenue, New York. The corridor lighting unit gives an extensive type of distribution along the corridor and an intensive distribution across the corridor. It is designed for 75-watt, 100-watt and 150-watt lamps to give uniform illumination.

New Trade Literature

WATT-HOUR METERS.—The Sangamo Electric Company, Springfield, Ill., has issued bulletin No. 67, which describes and illustrates the various styles of the "Sangamo" type "H" alternating-current watt-hour meters.

TRAFFIC CONTROL EQUIPMENT.—The Essco Manufacturing Company, Peoria, Ill., has issued a bulletin covering its mushroom "Stop and Go" traffic control system for manual, automatic, semi-automatic or synchronous operation. It contains illustrations of the various types and mountings and typical installations.

HIGH-VOLTAGE COMPENSATOR. — The Electric Controller & Manufacturing Company, 2700 East Seventy-ninth Street, Cleveland, is distributing bulletin No. 1,047, which describes and also illustrates the "EC&M" automatic high-voltage compensator for alternating-current squirrel-cage motors.

MECHANICAL ATOMIZER AND AIR REGISTER.—Bulletin No. 105 issued by the Peabody Engineering Corporation, 110 East Forty-second Street, New York City, describes the "Peabody-Fisher" wide-range mechanical atomizer and air register for use with oil-burning equipment. It gives instructions for operating the equipment and contains illustrations showing various installations.

PORCELAIN SIGN RECEPTACLES.—Bulletin No. 17-32 issued by Harvey Hubbell, Inc., Bridgeport, Conn., covers the "Hubbell" porcelain sign receptacles for metal signs and outlet boxes.

SAFETY HANDLE. — The Industrial Products Company, 1001 Chestnut Street, Philadelphia, is distributing a leaflet calling attention to its "C. & E." universal safety handle for extension cords and drop lights.

DAMPER REGULATORS.—Bulletin No. 5A, issued by the Atlas Valve Company, 282 South Street, Newark, N. J., covers the "Victor" damper regulators for low-pressure and vapor-heating boilers, medium-pressure power boilers and high-pressure power plants. Diagrams are given showing how to apply the regulators to boilers.

TELEPHONE PROTECTOR. — The Osborne Electric Company, Box 646, Rochester, N. Y., has issued bulletin No. 9, describing and illustrating its various types of telephone protectors.

ELECTRICAL INSULATION.—The Panelyte Company, Trenton, N. J., is distributing a booklet in which it describes "Panelyte" for insulating purposes. It contains data giving comparative physical and electrical properties of "Panelyte," marble, slate, soapstone and asbestos panels, and gives a partial list of uses of "Panelyte" insulation.

HEAT EXCHANGERS—The Griscom-Russell Company, 90 West Street, New York City, is distributing a leaflet, known as form 201, calling attention to its "Twin Multiwhirl" and "Twin Vaneflo" heat exchangers.

CANOPY SWITCH.—Bulletin No. 17-33 issued by Harvey Hubbell, Inc., Bridgeport, Conn., describes the "Hubbell" toggle canopy switch.

WATT-HOUR METER—"Proven by Ten Years" is the title of a booklet issued by the Sangamo Electric Company, Springfield, Ill., in which it describes and illustrates the type "H" Sangamo meter.

ELECTRIC MELTING POT.—Harold E. Trent, 1524 Chestnut Street, Philadelphia, is distributing a leaflet describing the "Trent" electric melting pot for continuous service.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number.

An agency is desired in Bremen, Germany (No. 12,154), for automobile accessories, especially automatic electric windshield cleaners.

An agency is desired in Bergen, Norway (No. 12,196), for batteries for automobiles.

Purchase is desired in Copenhagen, Denmark (No. 12,090), of ebony cases for battery cells for automobiles.

An exclusive agency is desired in Amsterdam, Netherlands (No. 12,091), for electrical apparatus.

An agency is desired in Caracas, Venezuela (No. 12,140), for electrical goods.

Purchase is desired in Bahia, Brazil (No. 12,145), of electrical supplies.

Purchase is desired in Madrid, Spain (No. 12,185), of electrical wiring supplies and fixtures.

Purchase and agency is desired in Berlin, Germany (No. 12,088), for measuring instruments and rheostats and electrical and radio novelties.

An agency is desired in Valetta, Malta (No. 12,089), for radio sets and parts.

New Incorporations

THE SOUTH TAMPA ELECTRIC COMPANY, Tampa, Fla., has been organized with a capital stock of $160,000 to construct and operate an electric plant in connection with fertilizer works on Ruskin Road. The officers are: Harry L. Pierce, president; Earle G. Moore, vice-president; Norton P. Webber, secretary and treasurer; James E. McKeen, general manager, and G. C. Henry, consulting engineer.

Construction News

Projects, Plans, Bids and Contracts, Contemplated or Under Way

New England States

BOSTON, MASS.—The Edison Electric Illuminating Company has been granted permission to issue $7,785,700 (par value) in capital stock, which is to be sold at $155 per share, the proceeds to be used for extensions already made and contemplated.

CAMBRIDGE, MASS.—The City Council has adopted a resolution authorizing the city electrician to investigate the advisability of installing an ornamental lighting system on Prospect Street between Cambridge Street and Massachusetts Avenue.

BRIDGEPORT, CONN.—The United Illuminating Company has awarded contract for the construction of its new power station building at Powder Point, at the foot of East Main Street, to the W. & M. Watts Construction Company, New York City. Westcott & Mapes, Inc., New Haven, are engineers.

Middle Atlantic States

BALDWINSVILLE, N. Y.—The property of the Seneca River Power Company has been acquired by the Syracuse Lighting Company, Inc. Extensions and improvements are planned for the Seneca River system, which supplies energy in northern Onondaga and southern Oswego Counties.

BINGHAMTON, N. Y.—A resolution has been adopted by the Real Estate Board calling upon the City Council to take steps to secure an improved lighting system on Main Street from the Court Street bridge to Johnson City.

BROOKLYN, N. Y.—Bids will be received by the Superintendent of School Buildings, Board of Education of the City of New York, corner of Flatbush Avenue Extension and Concord Street, Brooklyn, until Nov. 18 for electric wiring and fittings and for gas and electric fixtures in new Public School 207, Fillmore Avenue.

CAMDEN, N. Y.—The village officials have applied to the Public Service Commission for authority to transfer the municipal electric plant and distributing system to the Niagara, Lockport & Ontario Power Company, Buffalo. The Niagara company proposes to extend its transmission lines from its substation now under construction in Orwell through the towns of Orwell, Albion, Williamstown, Florence and Camden.

CATTARAUGUS, N. Y.—The Cattaraugus Electric Light & Power Company has applied to the Public Service Commission for permission to sell its system and franchises to the Olean (N. Y.) Electric Light & Power Company. Authority is also asked for the erection of a transmission line from Mansfield through the town of New Albion to the village of Cattaraugus.

FLUSHING, N. Y.—Bids will be received by the Superintendent of School Buildings, Board of Education of the City of New York, Flatbush Avenue Extension and Concord Street, Brooklyn, until Nov. 21 for fire signal systems (fire prevention work to comply with orders of the Fire Department) in Public Schools 1, 4, 5, 6, 7, 11, 12, 14, 16, 17, 20, 22, 23, 27, 31, 67, 68, 71, 76, 77, 78, 79, 81, 83, 84, 85, 86, 87, 88, 89, 92, Flushing High School and New York Parental School, Borough of Queens.

GENEVA, N. Y. — The Empire Gas & Electric Company has been authorized to extend its transmission lines into the towns of Varick and Fayette, and approval is given of franchises granted by the town boards. It proposes to erect a transmission line from its plant in Seneca Falls through the above-named towns, passing through the hamlets of Fayette and Romulus.

MARGARETVILLE, N. Y.—The Village Board has contracted with the New York State Gas & Electric Corporation, Ithaca, for street-lighting service.

NEW YORK, N. Y.—Bids will be received by the State Hospital Commission, Capitol, Albany, until Dec. 3 for two electric freight elevators for the Manhattan State Hospital, Ward's Island.

NEW YORK, N. Y.—Bids will be received by the Superintendent of School Buildings, Board of Education of the City of New York, Flatbush Avenue Extension and Concord Street, Brooklyn, until Nov. 25 for electric wiring and fittings and lighting fixtures for new Public School 116, Borough of Manhattan.

RICHMOND, N. Y.—Bids will be received by the Superintendent of School Buildings, Board of Education of the City of New York, Corner of Flatbush Avenue Extension and Concord Street, Brooklyn, until Nov. 25 for electric wiring and fittings and gas and electric fixtures for new Public School 40, New Brighton, Borough of Richmond. Also electric wiring and fittings and gas and electric fixtures for new Public School 41 in New Dorp, Borough of Richmond.

SYRACUSE, N. Y.—The Syracuse Lighting Company has arranged for an issue of $1,570,000 in capital stock, the proceeds to be used for extensions and improvements.

SYRACUSE, N. Y.—Application has been made to the Public Service Commission by the Syracuse (N. Y.) Lighting Company for permission to exercise a franchise granted by the Town Board of Manlius and for permission to erect new transmission lines in and about the village of Kirkland. The line will be extended from Minoa and will furnish street-lighting service as well as domestic and power purposes. The cost is estimated at about $7,900.

NEWARK, N. J. — The Public Service Electric & Gas Company has acquired dock property on the Passaic River, just south of the Clay Street bridge, on which it intends to erect an automatic substation.

VENTNOR, N. J.—Extensions and improvements to the street-lighting system are under consideration by the City Council. Street lighting service is furnished by the Atlantic City (N. J.) Electric Company.

ELLWOOD CITY, PA.—The Crescent Portland Cement Company, Wampum, writes that it does not contemplate the construction of a power house or work of any nature at Ellwood City or elsewhere, as reported in the issue of Oct. 18.

KANE, PA.—The City Council is considering extensions to the street-lighting system, to cost about $15,000.

SCRANTON, PA. — Extensions to the ornamental lighting system in all parts of the city are under consideration by the City Council.

TOWNVILLE, PA.—The installation of a street-lighting system is under consideration by the Village Board of Trustees.

CENTREVILLE, MD.—Plans are under consideration to extend the municipal power line from Queenstown through Grasonville and Chester and to Stevensville to furnish electrical service in those towns. The cost is estimated at $10,000.

HAGERSTOWN, MD.—The Potomac Edison Company, Washington, D. C., has applied to the Maryland Public Service Commission, for permission to issue stock in the amount of $450,000 in capital stock, part of the proceeds to be used for exten-

sions and improvements in its systems in Maryland, Pennsylvania and West Virginia.

NORFOLK, VA.—The Yorco Power Company, Dickson Building, recently incorporated, is planning to erect a transmission line from Langley Field through Poquson District to Odd, Jeff and Messick, a distance of 12 miles, to cost about $15,000. Electricity will be purchased from the Newport News & Hampton Railway, Gas & Electric Company.

SHENANDOAH, VA. — Bonds to the amount of $50,000 have been authorized, part of the proceeds to be used for rebuilding the municipal electric plant.

WASHINGTON, D. C.—Bids will be received by the Chief of Air Service, United States Army, until Nov. 24, for 200 magnetically operated starting switches, 200 safety push-buttons for starting switches, 200 navigation light signal switches and 300 landing switch assemblies (Circular CAS-42).

North Central States

GEDDES, MICH.—The Detroit (Mich.) Edison Company is considering plans for the rebuilding of its local plant, destroyed by fire recently, with loss of about $35,000.

BRUNERSBURG, OHIO.—Steps have been taken to secure the erection of a transmission line from Defiance to Brunersburg, to furnish electricity here.

BLACK RIVER FALLS, WIS.—The City Council contemplates the construction of a filtration gallery, including pumping equipment, etc., for which bids will soon be asked.

CRIVITZ, WIS.—The electric power plant of the Crivitz Pulp & Paper Company has been acquired by the Wisconsin Public Service Corporation, Green Bay.

FOND DU LAC, WIS.—Preparations are being made by the Sanitary Refrigerator Company for extensions and improvements to its plant, to cost about $100,000. The plans include an electric generating plant, to be used for emergency purposes.

MANITOWOC, WIS.—Contract for general construction of the proposed electric railway between Manitowoc and Sturgeon Bay has been awarded to the Edward Shuster Construction Company, Denmark. The proposed railway will be 61 miles long and will cost about $2,500,000.

SHEYBOYGAN, WIS. — Agitation has been renewed by the Sheboygan Business Men's Association for the installation of an ornamental lighting system on Pennsylvania Avenue, from North Eighth Street to the Chicago & Northwestern Railroad Station.

DULUTH, MINN.—The Minnesota Power & Light Company is arranging an issue of $2,200,000 in capital stock, part of the proceeds to be used for extensions and improvements.

ROCHESTER, MINN.—All bids submitted for construction of a dam near the municipal electric plant have been rejected by the City Council. New bids, it is understood, will be asked at an early date.

WEBSTER CITY, IOWA. — The Cass Light & Power Company has applied to the Board of Supervisors of Hamilton County for a franchise to erect transmission lines on the highways in Hamilton County.

MEXICO, MO.—Extensive improvements are contemplated by the Missouri Power & Light Company to its local plant, involving an expenditure of about $150,000. The buildings will be enlarged, new electrical machinery installed, and the capacity of the water and gas plant will be doubled.

REDFIELD, S. D.—The City Council has engaged Arthur L. Mullergren, consulting engineer, Gates Building, Kansas City, Mo., to make a survey and report on the municipal electric light and power plant and to prepare specifications for new equipment necessary. William Issenhuth is Mayor.

Southern States

CARY, N. C.—The City Council plans extensions and improvements in the municipal electric light plant and waterworks system, for which bonds to the amount of $100,000 were recently voted.

ELLENBORO, N. C.—Contract has been awarded to the Piedmont Electric Company, Asheville, for the installation of an electric lighting system, for which $10,000 in bonds has been authorized.

MOORESBORO, N. C. — The Piedmont Electric Company, Asheville, has been awarded contract for the installation of an electric lighting system, for which $12,000 in bonds has been authorized.

NORTH WILKESBORO, N. C. — The Board of Commissioners contemplates extensions and improvements in electric system and waterworks, to cost about $15,000.

SALISBURY, N. C.—The Board of Aldermen has accepted the proposal of the North Carolina Public Service Company, Greensboro, for the installation of an ornamental lighting system in the business district, to cost $50,000.

PICKENS, S. C.—The contract for the erection of a transmission line from Pickens to Easley and for rewiring of houses in Pickens has been awarded to the Huntington & Guerry Company, Greenville, at $24,985.

WILLISTON, S. C.—The Edisto Public Service Company, Denmark, which recently acquired the municipal electric plant, has contracted with the Aiken-Augusta Railway & Electric Company, Augusta, to furnish electricity at substation. The Edisto company plans to erect a 44,000-volt transmission line from Williston to Branchville and will supply electrical service in Williston, Elko, Blackville, Barnwell, Lees, Govan, Olar, Bamberg and Branchville.

COLUMBUS, GA.—The City Commission has approved plans for improving the lighting facilities next year in the territory to be annexed Jan. 1, 1925. The street-lighting service is furnished by the Columbus Electric & Power Company.

APOPKA, FLA.—At a recent election the proposal to take over the water and electric light plant, to be owned and operated by the municipality, was carried.

DAYTONA, FLA. — The Florida Coast Investment Company plans the construction of a steam-operated electric plant and ice-manufacturing unit for service in connection with the development of the Inlet Terrace tract, for which contract has been awarded to Cornell-Mathews & Walker, Orlando, Fla.

LITTLE ROCK, ARK.—The installation of additional street lamps is under consideration by the lighting committee.

BATON ROUGE, LA.—The Baton Rouge Electric Company plans to remove overhead electric wires from the business district.

DUSTIN, OKLA.—The local electric light and power plant was recently destroyed by fire.

FAIRFAX, OKLA. — C. F. Huffaker, owner of the Fairfax electric plant, is planning to erect a high-tension transmission line, 6 miles long, from Fairfax to Ralston, also crossing the Arkansas River. The cost is estimated at $25,000.

HUGO, OKLA.—The City Council contemplates the installation of street-lighting system, in connection with waterworks improvements, to cost about $55,000, for which bonds recently were voted.

MAUD, OKLA.—The Oklahoma Gas & Electric Company contemplates the installation of three additional 100-kva. transformers in its local station, to meet the increasing demand for service in Seminole, Prague and Harjo. Transmission lines to Wewoka will also be increased from 15,000 volts to 63,000 volts.

NORMAN, OKLA.—The installation of an ornamental lighting system on Main Street from the tracks of the Santa Fé Railroad to Crawford Avenue, to cost about $25,000, is under consideration. F. Cobb is city engineer.

AUSTIN, TEX.—The Water & Light Commission contemplates the installation of a lighting system on South Congress Avenue.

CANYON, TEX.—The Texas Public Utilities Company, subsidiary of the Texas Power & Light Company, Dallas, has acquired the local electric plant, owned by A. J. Arnold, which it will connect with its transmission system in this section.

GREENVILLE, TEX. — All bids submitted for turbines for the municipal electric plant have been rejected by the City Council. New bids, it is reported, will be opened on Nov. 18.

McALLEN, TEX.—Bids will be received until Dec. 1 by J. M. Carroll, president of Carroll College, for construction of a college building and a power house, to cost about $300,000. H. Smith, Commerce National Bank Building, San Antonio, is architect.

NAVASOTA, TEX.—The Western Public Service Company, Colorado Springs, Col., contemplates the erection of a transmission line from Navasota to Anderson.

Pacific and Mountain States

KELSO, WASH.—Plans have been approved by the County Commissioners of Drainage District No. 1, Kelso, for the installation of a larger pumping system, electrification of pumping plant and deepening of drainage canals.

PORT ANGELES, WASH.—The Federal Power Commission has extended the permit of the Elwha Power Company for a 9,000-hp. hydro-electric development on Elwha River in Clallam County. The project includes a diversion dam near the mouth of Griff Creek and a conduit 3½ miles long, to deliver water to power house at mouth of Little River.

TACOMA, WASH. — Bids will be received by Ira C. Davisson, Commissioner of Light and Water, until Nov. 24 for equipment for the Cushman power project as follows: Item 12—pole hardware; Item 13—315,000 linear ft. of 7/16-in. Siemens-Martin strand-galvanized guy wire; Item 14—16,854 suspension insulators; Item 15—sixty post insulators; Item 16—insulator hardware; Item 18—one power-line duplex carrier telephone system.

ALAMEDA, CAL.—The installation of a new street-lighting system in Park Street is under consideration by the City Trustees. J. B. Kahn is superintendent of the municipal electric plant.

GLENDALE, CAL. — A resolution has been adopted by the City Council providing for the installation of an ornamental lighting system on Los Felix Road, from the Southern Pacific Railway line to Glendale Avenue.

LOS ANGELES, CAL.—Plans are under way for the installation of 100 traffic signals on various streets, to cost about $25,000. H. A. Van Norman, City Hall, is engineer.

LOS ANGELES, CAL.—Bids will be received until Nov. 17 by the Board of Public Works for motor-generator sets, storage batteries and one gasoline-engine-driven generator for the local power plant.

LOS ANGELES, CAL.—An appropriation of $1,200,000 has been made by the Bureau of Power and Light to be expended to increase the distributing facilities of the bureau to factories with heavy power needs in the San Fernando Valley. This amount does not include any money for equipment needed to generate and distribute power necessary to the commercial and domestic growth of the city.

OAKLAND, CAL.—Preliminary plans are being prepared by C. E. Hardy, city electrician, for a traffic signal system for the city, to cost about $30,000.

SOUTH PASADENA, CAL. — The City Council plans the installation of ornamental street-lamps on Bonita Drive, comprising fourteen concrete standards; Orange Grove Avenue, twenty standards; Mission Street and Pasadena Avenue, ninety-four standards, and on Mission Street, between Fair Oaks Avenue and the city limits, east, thirty-four standards.

SALT LAKE CITY, UTAH.—The Utah Power & Light Company has applied for permission to construct a hydro-electric power plant on the Green River at Split Mountain, to develop 140,000 hp.

TOMBSTONE, ARIZ.—Plans are being prepared by Jules L. Vermeersch, Phoenix, engineer, for the construction of a municipal light and power plant.

CASPER, WYO. — Contract has been awarded by the City Council for extension to the ornamental lighting system, to cost about $18,000.

Canada

DUNDAS, ONT.—Plans are being considered by the Bell Telephone Company to lay underground cable here, to cost about $25,000.

ST. CATHARINES, ONT. — The City Council is considering extensions to the street-lighting system.

SHAWINIGAN FALLS, QUE. — The Shawinigan Water & Power Company, it is understood, contemplates at 20,000-hp. hydro-electric development on the Bastican River at St. Narcisse, where the North Shore Power Company, Three Rivers, a subsidiary of the Shawinigan company, already has a small plant. The cost is estimated at $1,500,000.

SHAWVILLE, QUE. — Plans are being considered to rebuild the municipal electric plant, recently destroyed by fire, causing a loss of about $15,000.

Electrical Patents

Announced by U. S. Patent Office

(Issued October 7, 1924)

1,511,046. FLASHLIGHT; Edmund R. Barany, Brooklyn, N. Y. App. filed July 8, 1922. Using more than one lamp with a single control.

1,511,050. TEMPERATURE REGULATOR; Edgar F. Collins and Albert N. Otis, Schenectady, N. Y. App. filed Feb. 20, 1922. For electric furnaces and the like.

1,511,064. ELECTRIC LOCOMOTIVE; Edward D. Priest, Schenectady, N. Y. App. filed Aug. 4, 1920. Using at least three trucks operating independently.

1,511,071. SELF-STARTING SYNCHRONOUS MOTOR; Henry E. Warren, Ashland, Mass. App. filed June 14, 1922. Miniature type as used in clocks.

1,511,075. CURRENT LIMITER; Chester I. Hall, Fort Wayne, Ind. App. filed Jan. 25, 1921. Electromagnetic contact device.

1,511,089. AUTOMATIC CALLING DEVICE; Charles E. Mallory, Waupun, Wis. App. filed Jan. 21, 1921.

1,511,097. EMERGENCY LIGHTING SYSTEM; Oscar W. Althoff and Leonard S. Baluta, Berwick, Pa. App. filed June 28, 1921. For theaters, etc.

1,511,127. RADIO COUPLER CONSTRUCTION; Charles Hermann, Binghamton, N. Y. App. filed Sept. 19, 1923.

1,511,138. ELECTRICALLY DRIVEN DEVICE; Jacob J. Rieder and Henry G. Hoesly, New Glarus, Wis. App. filed Aug. 24, 1923. Return device for portable apparatus.

1,511,194, 1,511,195, 1,511,196, 1,511,197. PROCESS OF UNITING METALS; John B. Austin, Cleveland, Ohio. App. filed Aug. 18, 1924. Rail bonds.

1,511,206. ELECTRIC FIXTURE; John Cuthbert, Chicago, Ill. App. filed May 21, 1920.

(Issued October 14, 1924)

1,511,229. TRANSFORMER CORE FOR RADIO WORK; Raymond G. McKee, Delhi, N. Y. App. filed Nov. 4, 1921. Closed core.

1,511,230. PORTABLE SECONDARY BATTERY; Ralph Martin, Brooklyn, N. Y. App. filed Dec. 22, 1922.

1,511,253. THIRD-RAIL CONTROL; William Alt, Brooklyn, N. Y. App. filed Oct. 11, 1922. Means for lighting up any section in which a train may be stalled and disconnecting third-rail.

1,511,267. LAMP SOCKET; Richard H. Croninger, Dayton, Ohio. App. filed March 22, 1920. Bayonet-slot type.

1,511,269. SMOOTHING IRON; Mattine F. Decker, Minneapolis, Minn. App. filed April 20, 1923.

1,511,271. METHOD OF INCREASING THE LIFE OF DRY CELLS; Harold De Olaneta, New Haven, Conn. App. filed Dec. 22, 1919.

1,511,276. RESISTANCE COIL; Albin Frohne, Chicago, Ill. App. filed Jan. 20, 1922. For use with toy electric railroads.

1,511,277. METHOD OF MANUFACTURING COMMUTATORS; Albin Frohne, Chicago, Ill. App. filed April 7, 1922.

1,511,314. LIGHTNING ARRESTER; Alfred L. Atherton, Pittsburgh, Pa. App. filed Jan. 24, 1921. Multiple-gap type.

1,511,316. COMMUTATOR CYLINDER; Arthur J. Bastian, Wilkinsburg, Pa. App. filed Jan. 31, 1921. Molded type.

1,511,326. DUPLEX TELEGRAPHY; John M. Fell, Hackensack, N. J. App. filed Nov. 16, 1921. Ground-return system.

1,511,329. CONTROL APPARATUS; Arthur J. Hall, Pittsburgh, and Paul L. Mardis, Swissvale, Pa. App. filed July 15, 1919. For electric railway.

1,511,332. MAGNETIC DAMPER FOR ELECTRIC ARCS; William E. Harrison, Philadelphia, Pa. App. filed Nov. 20, 1920.

1,511,341, 1,511,342, 1,511,343, 1,511,344. SYSTEM OF CONTROL; Henry D. James, Edgewood, Pa. App. filed March 14, 1921. For squirrel-cage induction motors.

1,511,345, 1,511,346, 1,511,347, 1,511,348. MOTOR HORN; William Kaisling, Chicago, Ill. App. filed April 21, 1920. As used on automobiles.

1,511,352, 1,511,353. THERMAL RELAY; Frederick H. Miller, Wilkinsburg, Pa. App. filed June 3, 1920.

1,511,360. ANTI-INDUCTIVE SYSTEM; Harold S. Osborne, New York, N. Y. App. filed March 4, 1920. For telephone circuits.

1,511,369. ELECTRIC CUT-OUT; Maurits J. Sandin, Wilkinsburg, Pa. App. filed June 17, 1920. Comprising a thermal-responsive element.

1,511,374. CONTROL APPARATUS; Karl A. Simmon, Edgewood Park, Pa. App. filed Dec. 3, 1919. For electric railway motors.

1,511,379. WIRE-RETAINING DEVICE; Paul G. Swars, Pittsburgh, Pa. App. filed March 5, 1923. For overhead-line apparatus for electric railways.

1,511,382. FLUID CIRCUIT INTERRUPTER; Dayton Ulrey and Daniel I. Mayne, Wilkinsburg, Pa. App. filed July 13, 1922. Applicable to electric iron, etc.

1,511,383. TROLLEY-CONDUCTOR DEVICE; Charles F. Wagner, Pittsburgh, Pa. App. filed Sept. 8, 1921. For protection between two sections when the trolley passes over.

1,511,391. CONTROL OF ELECTRIC MOTORS; Eric A. Binney, Sheffield, England. App. filed Jan. 12, 1923. For regenerative braking.

1,511,392. VOLTAGE-REGULATOR SYSTEM; Clarence A. Boddie, Pittsburgh, Pa. App. filed May 23, 1919. For governing the excitation.

1,511,393. SPEED-REGULATOR SYSTEM; Clarence A. Boddie, Pittsburgh, Pa. App. filed August 26, 1919. For governing the speed of induction motors.

1,511,408. SWITCH MECHANISM; Lawrence F. Kries, Baltimore, Md. App. filed Oct. 6, 1920. Safety type.

1,511,423. ELECTRIC CURRENT TRANSMISSION; Donald A. Quarles, Englewood, and Franklin Mohr, East Orange, N. J. App. filed April 30, 1923. Of telephone currents.

1,511,440. LEVER SWITCH FOR ELECTRIC SOCKETS; Reuben B. Benjamin, Chicago, Ill. App. filed June 28, 1922.

1,511,443. DENTAL WAX AND COMPOUND ANNEALER; Harry A. Bonoff, Los Angeles, Cal. App. filed May 24, 1923.

1,511,448. ELECTRICALLY PROPELLED AIRCRAFT; Alphonsus L. Drum, Chicago, Ill. App. filed Feb. 18, 1921.

1,511,491, 1,511,492. FLYWHEEL DYNAMO-ELECTRIC MACHINE FOR INTERNAL-COMBUSTION ENGINES; Ralph L. Aspden, Chorley, England. App. filed May 2, 1922.

1,511,534. INSULATED CONNECTOR; Louis Steinberger, Brooklyn, N. Y. App. filed May 5, 1919. Bushing.

1,511,538. ELECTRIC MOTOR; Harve R. Stuart, Springfield, Ohio. App. filed Jan. 3, 1922. Having an axially or end-wise movable rotor.

1,511,553. HEATING UNIT FOR RADIATORS; Thomas H. Willson, Seattle, Wash. App. filed Nov. 30, 1923. Hot-water-heating systems.

1,511,566. ELECTRIC HAMMER; George L. Kollock, Seattle, Wash. App. filed July 12, 1923.

1,511,567. METHOD AND DEVICE FOR THE AUTOMATIC STARTING OF CONTINUOUS OR ALTERNATING-CURRENT MOTORS BY MEANS OF CONTACT DEVICES; Paul H. F. Lambert, Paris, France. App. filed Jan. 14, 1922.

1,511,581. AUTOMATIC BATTERY-CHARGING APPARATUS; John J. Ritter and John H. Ritter, Seattle, Wash. App. filed June 26, 1923.

1,511,594. LIGHTING FIXTURE AND OUTLET RECEPTACLE; Rudolph E. De Lamar, New York, N. Y. App. filed June 12, 1922.

1,511,595. PERMEAMETER; Frank P. Fahy, New York, N. Y. App. filed May 11, 1918.

1,511,600. RAIL CONNECTOR FOR TOY RAILWAYS; Alan R. Fergusson, Buffalo, N. Y. App. filed Sept. 27, 1922.

1,511,608. DYNAMO-ELECTRIC MACHINE; Ernest Harrison, Newcastle-on-Tyne, England. App. filed Aug. 29, 1919. For use on automobiles.

1,511,629. ELECTRICAL TESTING SYSTEM; Harry Nyquist, Elmhurst, N. Y. App. filed July 16, 1921. For determining the magnitude of the unbalance between two networks such as a signaling circuit and a network designed to balance it.

1,511,636. CUT-OUT BOX AND METER ADAPTER; Albert B. Rypinski, Brooklyn, N. Y. App. filed May 12, 1921.

1,511,660. DOORBELL SIGNAL INDICATOR; Guy C. Cyr, Escanaba, Mich. App. filed Jan. 24, 1921.

1,511,661. DISHWASHER; Howe E. Dantzebecher, Philadelphia, Pa. App. filed Jan. 12, 1921.

1,511,674. ATTACHMENT PLUG; Stanley McClatchie, Cambridge, Mass. App. filed Jan. 12, 1920.

1,511,694. ELECTRICAL APPARATUS; James M. Weed, Schenectady, N. Y. App. filed July 15, 1920. Arrangement of parts of transformers, reactors and the like.

1,511,708. THERMOSTATIC ELECTRIC CIRCUIT CONTROLLER; Allen E. Chisholm, Portland, Ore. App. filed April 13, 1920.

1,511,717. ELECTRICAL APPARATUS; Louis F. Blume, Pittsfield, Mass. App. filed Oct. 18, 1920. Transformer with one end grounded with an adjacent condenser element.

1,511,744. CIRCUIT PROTECTIVE DEVICE; Floyd J. Metzger, New York, N. Y., and John T. Orr, Elizabeth, N. J. App. filed Nov. 1, 1922. For radio aërials, telephone lines, etc.

1,511,755, 1,511,756. ELECTRICAL TESTING SYSTEM; Samuel I. Cory, Elmhurst, N. Y. App. filed July 16, 1921. For determining the degree of unbalance between two networks such as a signaling circuit and the network designed to balance the said circuit.

1,511,809. SNAP SWITCH; Monroe Guett, Hartford, Conn. App. filed April 21, 1922.

1,511,826. STORAGE BATTERY; Rufus N. Chamberlain, Chicago, Ill. App. filed Dec. 12, 1923. Lead type.

1,511,838. ELECTRIC FUSE; Elmer L. Ogle, Chicago, Ill. App. filed Oct. 31, 1921. For multiphase circuits with the fuse wire affected by a heating element in the circuit.

1,511,849. METHOD OF WELDING TUBING; James H. Taylor, Chicago, Ill. App. filed Jan. 21, 1922. Scarfed weld.

1,511,855. DOUBLE-PLUG CONNECTOR FOR ELECTRICAL CIRCUITS; Seymour H. Wentz, East Orange, N. J. App. filed Nov. 28, 1922.

1,511,866. ROTARY SNAP SWITCH; Carl E. Anderson, Stratford, Conn. App. filed Sept. 11, 1923.

1,511,914. CANOPY FOR ELECTRIC FIXTURES; Robert H. Savory, Worcester, Mass. App. filed Jan. 24, 1921.

1,511,935. ELECTRICAL CONDENSER; Ernest A. Bayles and Harold Higham, Helsby, England. App. filed July 20, 1921. Liquid impregnating dielectric used and condenser units formed of laminae of papers and metal.

1,512,008. TEMPERATURE REGULATOR; Albert N. Otis, Schenectady, N. Y. App. filed Feb. 4, 1922.

(Issued October 21, 1924)

1,512,032. TRANSFORMER; Joseph Ledwinka, Philadelphia, Pa. App. filed May 19, 1919. In unit sections or halves to facilitate removal and replacement of the coils.

1,512,038. FIXTURE STUD; Frank A. Price, St. Louis, Mo. App. filed Oct. 27, 1919.

1,512,039. STREET-LIGHTING ACCESSORY; John B. Radford, Valeria, Quebec, Canada. App. filed Jan. 12, 1921. With the current supply cables terminating in the lamp socket of the lamp post.

1,512,051. ELECTRIC STEERING COMPASS; Ludwig Rellstab, Zeist, Netherlands. App. filed Nov. 20, 1920.

1,512,064. AUTOMATIC ELECTROMAGNETIC SWITCH; Hermann Sundhaussen, Essen-on-the-Ruhr, Germany. App. filed March 31, 1921.

1,512,067. HYDROLIGHT CABINET; Hans J. Thomsen, Neosho, Mo. App. filed Sept. 2, 1922. Combined electric light bath or shower bath.

1,512,070. PRINTING TELEGRAPHY; Gilbert S. Vernam, Brooklyn, N. Y. App. filed Nov. 4, 1921.

1,512,073. ADVERTISING MACHINE; Thomas R. Wiwi, Chicago, Ill. App. filed July 19, 1922. Illuminating device having traveling signs.

1,512,083. ELECTRIC SWITCH; George A. Burnham, Saugus, Mass. App. filed June 11, 1920. Oil circuit breaker with atmospheric vent, means to catch expelled oil and means independent of vent to restore oil level.

1,512,101. TELEPHONE SYSTEM; Harry H. Ide, Chicago, Ill. App. filed Jan. 20, 1919. Automatic or semi-automatic systems in which switches are used for connecting a calling line to an idle trunk.

1,512,122. ELECTRIC TOASTING MACHINE; John Marcel, New York, N. Y. App. filed April 26, 1923.

1,512,135. ELECTRIC GENERATING SYSTEM; Guy R. Radley, Milwaukee, Wis. App. filed March 17, 1921. Farm-lighting type.

1,512,169. SINGLE-BUTTON SWITCH; Auton F. Greiner, Detroit, Mich. App. filed Dec. 29, 1922. Push-button type.

1,512,182. ELECTRIC SWITCH BOX; Axel W. Lundstrom, New York, N. Y. App. filed Dec. 22, 1920. For toggle switch.

1,512,185. SYSTEM OF DISTRIBUTING ELECTRICITY AND APPARATUS THEREFOR; Daniel Salazar M., Medellin, Colombia. App. filed March 7, 1922. Combined house-lighting and street-lighting system.

1,512,203. COMBINATION CONTACT DEVICE; Frank C. De Reamer, Bridgeport, Conn. App. filed Oct. 21, 1921. Attachment plug receptacle to fit various types of plugs.

1,512,209. ELECTRIC HEATER; Truman S. Fuller and John A. Ward, Schenectady, N. Y. App. filed August 24, 1921. With means for automatically opening the circuit at a predetermined temperature, as in a flatiron, etc.